



Impact of sedentary behaviour on the development of diseases in children and adolescents – a review of the literature

Wpływ siedzącego trybu życia na rozwój chorób u dzieci i młodzieży – przegląd literatury

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■ Abstract

Introduction and Objective. Sedentary lifestyles are becoming an increasingly serious health problem among children and adolescents. Physical activity recommendations are adhered to by a small percentage, and analysis of data from previous years indicates that the problem will worsen. The aim of the study is to analyze the impact of a sedentary lifestyle on the risk of developing diseases and disorders in developmental age.

Brief description of the state of knowledge. Among the causes of sedentary behaviour, can be included daily activities that do not require significant energy expenditure. These include spending time on transportation, sitting or lying down, time spent in front of a screen and at the school desk, etc. Factors predisposing to a sedentary lifestyle include lower parental education levels, higher family incomes, no or few siblings, and sleep deprivation. The consequences can include obesity, mental disorders, sleep disorders, postural defects, myopia and poorer social skills. This can lead to many health complications in adulthood. Following the recommendations of leading health organizations can help reduce the problem of sedentary lifestyles and the resulting health consequences.

Summary. Sedentary lifestyles among children and adolescents lead to developmental disorders and many diseases. It is therefore necessary to educate the public about the possible dangers of low physical activity. According to numerous studies, sedentary lifestyle is a modifiable environmental factor and its prevention is possible.

■ Key words

child, adolescent, sedentary behavior, disease

■ Streszczenie

Wprowadzenie i cel pracy. Siedzący tryb życia staje się coraz poważniejszym problemem zdrowotnym wśród dzieci i młodzieży. Zaleceń odnośnie do aktywności fizycznej przestrzega niewielki odsetek tej grupy, a analiza danych z ubiegłych lat wskazuje na to, że problem ten będzie się pogłębiał. Celem niniejszej pracy jest analiza wpływu siedzącego trybu życia na ryzyko rozwoju chorób i zaburzeń u osób w wieku rozwojowym.

Opis stanu wiedzy. Do przyczyn siedzącego trybu życia możemy zaliczyć codziennie czynności, które nie wymagają znacznych wydatków energetycznych. Są to m.in.: poruszanie się środkami komunikacji, czynności w pozycji siedzącej lub leżącej, czas spędzony przed ekranem czy w szkolnej ławce. Czynniki predysponujące do siedzącego trybu życia to niższy poziom wykształcenia rodziców, wyższe dochody w rodzinie, brak lub niewielka liczba rodzeństwa oraz niedobór snu. Konsekwencjami siedzącego trybu życia mogą być: otyłość, zaburzenia psychiczne, zaburzenia snu, wady postawy, krótkowzroczność, a także niższe umiejętności społeczne. Może to prowadzić do wielu powikłań zdrowotnych w dorosłości. Przestrzeganie zaleceń czołowych organizacji zdrowotnych może pomóc zmniejszyć problem siedzącego trybu życia i jego konsekwencji zdrowotnych.

Podsumowanie. Siedzący tryb życia wśród dzieci i młodzieży prowadzi do zaburzeń rozwojowych i wielu chorób. Konieczna jest edukacja społeczeństwa na temat możliwych zagrożeń wynikających z niskiej aktywności fizycznej. Według licznych badań siedzący tryb życia to modyfikowalny czynnik środowiskowy i możliwe jest jego wyeliminowanie.

■ Słowa kluczowe

dziecko, młodzież, siedzący tryb życia, choroba

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INTRODUCTION

Sedentary lifestyles are an increasingly important global problem that affects more than just adults. Current World Health Organization recommendations for 5–17-year-olds recommend at least 60 minutes of daily moderate to vigorous physical activity. According to the 2022 report on the state of physical activity in children and adolescents in Poland, only 15.6% of children and adolescents aged 10–19 meet these criteria [1]. A significant decline in the level of physical activity of Polish schoolchildren had already been observed before the COVID-19 pandemic [2], but after the pandemic, the problem rapidly worsened [3–5].

According to the World Health Organization (WHO), adolescence is the developmental phase following childhood. Children are those under the age of 10, and adolescents between the ages of 10–19 [6]. Together, these two periods are called the developmental age, defined as a sequence of positive changes that reinforce previously formed characteristics, and provide the basis for subsequent transformations. Among the environmental factors affecting people during the developmental period are socio-economic, psycho-social, biogeographical, lifestyle and chronic diseases, among others [7]. Sedentary behaviour, by definition, is any waking behaviour characterized by energy expenditure equal to or less than 1.5 metabolic equivalents (METs). This can occur in either a reclining, lying or sitting posture. Examples of sedentary behaviour include performing low-energy activities, such as use of electronic devices, e.g. tablet, mobile phone, TV or computer), reading, drawing and painting while sitting, time spent on transportation, such as bus, train or car, doing homework or time spent sitting at school [8].

OBJECTIVE

The aim of this study is to analyze the impact of a sedentary lifestyle on the risk of developing diseases and disorders among the young. This is crucial in order to be able to draw attention to the problem of decreasing levels of physical activity among the youngest residents of Poland and beyond. This will make it possible to identify the health consequences of a sedentary lifestyle and methods of their prevention. The key publications, PubMed and Google Scholar resources were searched, using the keywords: ‘sedentary behaviour’, ‘child’, ‘adolescent’, and ‘disease’, as well as textbooks and reference materials. 52 papers in Polish and English were selected

DISCUSSION

Causes of sedentary lifestyle. There are many reasons for the increasingly prolonged sedentary time among young people. One of them is travelling long distances to school and extracurricular activities by means of transportation such as car, bus and train. It has been shown that the longer the commute to school, the longer the sedentary time spent, on average. This relationship is particularly marked in girls [9]. It turns out that female children, children from higher-income families, children with no or few siblings, and children who sleep less, spend more sedentary time [10]. A higher parental education level is correlated with lower sedentary time [11].

A sedentary lifestyle is often associated with access to modern technology. The 21st century is a time not only when

technology is at its greatest and fastest booming, but also when access to technology is on the rise. Many years have passed since the invention of the Internet and computers, and the availability of the Internet and digital equipment continues to grow. According to Eurostat, a symbolic year for Europe was 2007, when the majority (53%) of households in the then European Union (27 countries) had access to the Internet. The rate of proliferation was so fast that in 2019 as many as 90% of European Union households had access to the Internet, and these statistics continue to grow. In the age of current technology, it is possible for people to function without leaving their homes, as most products can be ordered using an Internet connection – shopping, clothes, food with door-to-door delivery, cosmetics and much more. Eurostat data shows that in EU countries in 2019, as many as 60% of residents aged 16–74 bought goods or services online. This situation favours sedentary behaviour among both children and adults [12].

Despite the fact that global digitization and ubiquitous access to the Internet is a major facilitator in many key areas of people's lives and contributes to the development of science, the negative aspect of these is increasingly being addressed, especially in relation to children and young people.

Health consequences of sedentary behaviour. The period of the COVID-19 pandemic, when the number of people working and studying at home increased, was a time when screen-time increased significantly. Many papers are available from this period showing how social isolation and lack of any activity outside the home affected people's health. Increased use of psychological and psychiatric help was observed among both adults and children, with problems such as anxiety, sleep disorders, addictions, depression, and many others, being reported [13–15]. Studies from before the pandemic also show a clear link between sedentary behaviour and the incidence of mental disorders in children and adolescents [16, 17]. Interestingly, this relationship is particularly marked among obese adolescents [18].

An analysis of 27 studies indicate that higher levels of sedentary behaviour in minors are associated with a less healthy and less balanced diet. Such subjects consumed fewer fruits and vegetables and significantly more snacks high in sugar and calories [19]. A higher prevalence of eating disorders, lack of self-confidence and lower psychological well-being was observed among children and adolescents spending more screen-time [20]. The reason for this may be the frequent use of social media. Researchers have repeatedly confirmed the negative impact of the use of social media on their health children and adolescents. Consequences can include, for example, cyberbullying, reduced face-to-face interaction, and more frequent social comparisons regarding appearance [21–24]. According to the CENSIS 2021 report, more than 95% of teens use smartphones, most often using the platforms: Instagram (72%), TikTok (62%) and YouTube (58%). [25]. The American Academy of Paediatrics (AAP) recommends educating children about the dangers and how to safely navigate the Internet before they reach adolescence [26].

Obesity itself may be a consequence of sedentary behaviour [27–29]. It carries the risk of other obesity-related diseases, including cancers, hypertension, diabetes mellitus (type 2), insulin resistance, dyslipidaemia, and cardiovascular disease [30]. In view of the above phenomena, sedentary behaviour can be considered a trigger for the snowball effect, accelerating the occurrence of further obesity and metabolic

syndrome-related diseases. This is a particularly dangerous phenomenon in children, as obesity at a young age can significantly affect life expectancy, quality of life and health [31]. The effect of the level physical activity on the appetite control mechanism has been proven. It turns out that low levels of physical activity can deregulate this complex mechanism and be the cause of excessive appetite [32].

Many analyses show a link between sedentary behaviour and more frequent vision defects [33]. A study by Lisa O'Donoghue et al. of 661 Irish adolescents aged 12–13 years showed that, in contrast to sedentary lifestyles, regular physical activity was correlated with a lower risk of myopia [34]. A study by Guggenheim et al. of 9,109 British children confirmed this relationship [35]. On the other hand, a study on a smaller group – 307 Danish children – found no link between physical activity and myopia [36]. Further studies on a larger group of participants of different ethnic backgrounds are needed to confirm or reject this hypothesis.

Postural disorders and osteoarthritic pain in children and adolescents are increasingly being observed [37]. Numerous meta-analyses show an unequivocal link between the amount of sedentary time in this age group and a higher incidence of lower back pain [38–40]. Many researchers cite sedentary behaviour as one of the main causes of postural defects in children [41]. If left untreated, they can lead to reduced vital lung capacity, bone and lower back pain, decreased cardiopulmonary capacity, and even displacement of some internal organs [42]. Recommendations for the management of children with such defects mainly include exercise and physical activity, which have both preventive and therapeutic effects [43].

Sedentary lifestyles of children and adolescents may impair the length and quality of their sleep. Between 1999–2009, the average length of screen-time of American children increased from 6 hours 21 minutes to 7 hours 38 minutes per day. Children's sleep time in 2011 was estimated to have decreased by as much as an hour a day, compared to the length of sleep in the early 20th century [44]. Interestingly, screen-time has been shown to have a negative effect on sleep quality and length of sleep in infants and toddlers [45, 46]. Studies show that prolonged sedentary time, especially spent in front of a screen, can cause not only sleep disturbances, but also behavioural problems, such as peer problems, internalizing and externalizing [47]. Amy I. Nathanson and Patrick T. Fries examined the effects of children's exposure to background television and nighttime television viewing. They showed that children with higher exposure to these factors sleep significantly shorter than children with lower exposure. They also found that shorter sleep in these children was associated with neuropsychological function – theory of mind (the capacity to understand motives, mental states and feelings of others) [48].

Recommendations and guidelines from the American Academy of Child & Adolescent Psychiatry regarding the amount of time spent in front of a screen in children and adolescents include:

1. limiting screen use to only video calls with an adult until the child is 18 months old;
2. between the ages of 18–24 months it is permissible to watch educational programmes only with a parent or caregiver;
3. between 2–5 years of age, non-educational screen-time should be limited to about 1 hour on weekdays and 3 hours a day on weekends;
4. in children aged 6 and older, screen-time should be limited, and healthy habits should be encouraged.

By following these recommendations children can be protected from many negative health consequences in the future, and positively affect their development [49–51]. The WHO recommendations, in turn, refer not only to limiting the amount of time spent in front of a screen, but also to the recommended time for physical activity and optimal sleep time in children [52].

CONCLUSIONS

Sedentary behaviour among children and adolescents is becoming an increasingly important problem, and requires increasing people's awareness of the issue. More data are needed on larger study groups to understand the exact consequences of sedentary lifestyle. Sedentary behaviour includes activities with reduced energy expenditure, such as use of electronic devices, reading, drawing, time spent on transportation, time spent sitting at school. A significant decrease in physical activity in children was observed during the COVID-19 pandemic. Higher sedentary time is experienced by children with longer commute times to school, female children, children without siblings, children from higher income families and children who sleep less. The higher the educational level of parents, the lower the sedentary time in children. A very important factor that increases sedentary time in children is the use of electronic devices and the Internet, as children who spend a lot of time on digital entertainment at home are less interested in physical activity. The health consequences of sedentary behaviour and low physical activity in children include obesity and metabolic syndrome, osteoarticular pain, postural defects, myopia, as well as mental and sleep disorders.

The current recommendation is to significantly restrict children's access to electronic devices and the Internet and to educate parents about them. Limiting the access, together with replicating healthy habits related to physical activity, can have a positive impact on children's health and reduce the risk of many negative health consequences in the future.

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