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point of view

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The importance of an integrative view of behaviors adopted during the 24 hours of the day in physical activity and exercise interventions studies

A importância de uma visão integrativa dos comportamentos adotados nas 24 horas do dia em estudos de intervenção com atividade física e exercício

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Abstract – Given the reduced proportion of the 24 hours of the day spent with moderate to vigorous physical activities, there has been a recent appreciation of integrative and compositional approaches of the different behaviors adopted throughout the day for interpretations of health outcomes. This study points out the importance of integrating sleep time, sedentary behavior and physical activities of different intensities in the interpretation of results of physical activity and exercise interventions. We believe that this is a crucial strategy for better understanding the effects of interventions as well as for scientific progress in the area.

Key words: Exercise; Physical education and training; Sedentary lifestyle.

Resumo – *Considerando a reduzida proporção das 24 horas do dia ocupada com atividades físicas de intensidade moderada ou vigorosas, há uma valorização recente de abordagens integrativas e composicionais dos diferentes comportamentos adotados ao longo do dia para as interpretações de desfechos em saúde. Aqui chamamos a atenção para a importância da integração do tempo de sono, do tempo em comportamento sedentário e de atividades físicas de diferentes intensidades na interpretação de resultados de intervenções em atividade física e exercício. Acreditamos ser essa uma estratégia crucial para o melhor entendimento dos efeitos das intervenções, bem como para o progresso científico da área.*

Palavras-chave: *Educação física e treinamento; Estilo de vida sedentário; Exercício.*

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INTRODUCTION

Physical activity and physical exercise are established as important strategies for health promotion, prevention and treatment of various diseases. The benefits of regular moderate to vigorous physical activity (MVPA) or participation in physical exercise programs are more than evident in literature, so the current challenge seems to be to develop effective strategies to ensure adherence of different population subgroups to PA practice. In addition, in recent years, the role of sedentary behavior on health has also been highlighted[1]. Long and uninterrupted periods of time in activities with energy expenditure ≤1.5 METs - in a sitting, reclining or lying position during the waking period - are associated with negative outcomes in several organic systems[2]. Interestingly, although still controversial, the effects of some types of sedentary behaviors seem to be independent of the practice of MVPA or of participation in physical exercise programs[3].

Considering that most of the waking period is occupied with sedentary activities, recent evidence associated with the sedentary behavior paradigm has raised the concern with behaviors adopted and activities performed in the 24 hours of the day[2,4]. Thus, compliance with international recommendations of physical activity or guidelines for physical exercise prescription became a necessary condition, but insufficient for the understanding of many of the effects attributed to MVPA and physical exercise. As an example, a physical training program run three times a week, lasting 60 minutes per session, would account for only 2% of a person's week. Thus, the lack of control of physical activity and sedentary behavior during periods of exercise intervention could explain many curious results or even unexpected results.

INTEGRATION OF SLEEP TIME, SEDENTARY BEHAVIOR AND PHYSICAL ACTIVITY

This new perception of the compositional and integrative nature of behaviors adopted during the day has also increased the concern with other domains of life. Although the main focus of studies in this area is the leisure or commuting domain (in the case of physical activity), an increase in the interest in work and domestic activities has been observed. In these latter domains, despite initiatives linked to MVPA, the main intervention model has been the reduction and interruption of sedentary behavior, mainly by the substitution by light intensity physical activities. We have recently followed the boom of studies on standing desks to reduce/interrupt sitting time[5], in addition to interventions focused on changes in family habits[6] and in the sedentary behavior of older adults[7].

Still with regard to 24-h day limitation, for the monitoring of patterns of physical activities of different intensities and sedentary behavior, the sleep time should necessarily be estimated (which is not classified as sedentary behavior). Thus, a third behavior associated to health outcomes (especially dependent and confounding variables) is characterized, but it is still poorly controlled in physical activity or exercise intervention stud-

ies. As an example, especially from the diffusion of electronic equipment (e.g., cell phones, tablets and personal computers), we have seen that much of the sleep time has been replaced by screen-based sedentary behavior. Given the above, a doubly negative situation is observed, which could, in different ways, influence the results obtained with specific interventions[8]. These trends represent a possible new direction necessary for physical activity and exercise intervention studies.

The importance of controlling the behaviors adopted during the 24 hours of the day in physical activity and exercise intervention studies goes beyond the possible confusion generated in the evaluated outcomes. A relatively recent area of study has identified possible compensatory and synergistic effects of adherence to exercise programs or increased level of physical activity in specific domains of the day[9]. In other words, being more active in a particular domain of life (e.g., leisure) may favor the adoption of more active habits (synergistic effect caused by the benefits of physical activity) or less active (compensatory effect of fatigue caused by the activity) in other domains. Thus, it is plausible to assume that the involvement of people with lower functional status (sedentary, obese or elderly) in physical exercise programs improves their functional performance so that their ability to perform domestic tasks or active movements is increased, on the other, training with higher overloads could induce longer sedentary time during the day. In terms of public health, it is also worth identifying which is the dose of physical activity that in addition to optimizing adherence, causes smaller compensatory effects. It is also possible that different types of physical exercise have specific compensatory and synergistic effects. However, the literature is scarce and controversial in this regard[12,13]. These effects not controlled by the majority of studies can even vary between subjects, time and mediate / moderate the results of interventions[14,15].

FINAL COMMENTS

In this way, we emphasize the importance of adopting methods that help control the behaviors adopted in the 24 hours of the day, such as accelerometers and inclinometers, in interventions with physical activity and exercise. This seems to be an important step towards the advancement of scientific knowledge in the area of Physical Education. In this context, subareas associated with physical and sports training, which have sought to understand in an increasingly detailed way the effects of exercise protocols on multifactorial outcomes, are potentially leaving out valuable information for a better understanding and discussion of their results. Finally, we pose a question for reflection: do we really evaluate the effect of our interventions?

COMPLIANCE WITH ETHICAL STANDARDS

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Ethical approval

This article did not use data collected from humans and represents a scientific opinion of literature.

Conflict of interest statement

The authors have no conflict of interests to declare.

Author Contributions

Conception: DRPS and MESG. Wrote the paper: DRPS, DO, MESG.

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