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INCREASED PHYSICAL ACTIVITY IN OCCUPATIONAL TASKS DOES NOT GUARANTEE BETTER HEALTH: A TECHNICAL-SCIENTIFIC PARADOX

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ABSTRACT

Physical activity (PA) is a fundamental pillar in health promotion; however, the so-called "physical activity paradox" posits that occupational physical activity (OPA) may not offer the same health benefits as leisure-time physical activity (LTPA) and may even carry significant risks. This review analyzes the relationship between OPA and health outcomes, highlighting key differences in terms of intensity, duration, and context of physical exertion. The evidence shows that OPA, particularly in work tasks involving continuous demanding physical exertion or high-intensity repetitive activities, is associated with increased levels of inflammation, increased risk of cardiovascular mortality and negative mental health consequences, in contrast to the protective effects attributed to LTPA. This discrepancy highlights the relevance of the context in which PA is performed; whereas LTPA is usually self-managed and carried out in favorable environments, OPA is typically involuntary and occurs under demanding conditions. Specific interventions in the work environment, such as active design strategies and structured physical activity programs, present themselves as promising tools to counteract the detrimental effects of OPA. These findings underscore the need for differentiated approaches to PA promotion, recognizing the unique risks and benefits associated with each context. Addressing the PA paradox through specifically designed interventions could optimize health outcomes for workers in physically demanding roles, especially those with low levels of physical fitness.

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KEYWORDS: physical activity paradox; occupational physical activity; workplace interventions; cardiovascular risk.

EL AUMENTO DE LA ACTIVIDAD FÍSICA EN LAS TAREAS OCUPACIONALES NO GARANTIZA UNA MEJOR SALUD: UNA PARADOJA TÉCNICO-CIENTÍFICA

RESUMEN

La actividad física (AF) es un pilar fundamental en la promoción de la salud; no obstante, la denominada «paradoja de la actividad física» plantea que la actividad física ocupacional (AFO) podría no ofrecer los mismos beneficios para la salud que la actividad física realizada durante el tiempo libre (AFTL), e incluso conllevar riesgos significativos. Esta revisión analiza la relación entre la AFO y los resultados de salud, destacando las diferencias clave en términos de intensidad, duración y contexto del esfuerzo físico. La evidencia demuestra que la AFO, particularmente en tareas laborales que implican esfuerzos continuos exigentes en esfuerzo físico o de alta intensidad en actividades repetitivas, se asocia con un incremento en los niveles de inflamación, un mayor riesgo de mortalidad cardiovascular y consecuencias negativas para la salud mental, contrastando con los efectos protectores atribuidos a la AFTL. Esta discrepancia resalta la relevancia del

contexto en el que se realiza la AF; mientras que la AFTL suele ser autogestionada y llevada a cabo en entornos favorables, la AFO es típicamente involuntaria y ocurre bajo condiciones demandantes. Las intervenciones específicas en el entorno laboral, como las estrategias de diseño activo y los programas estructurados de actividad física, se presentan como herramientas prometedoras para contrarrestar los efectos perjudiciales de la AFO. Estos hallazgos subrayan la necesidad de adoptar enfoques diferenciados en la promoción de la AF, reconociendo los riesgos y beneficios únicos asociados con cada contexto. Abordar la paradoja de la AFO mediante intervenciones diseñadas específicamente podría optimizar los resultados de salud de trabajadores que desempeñan funciones físicamente exigentes, especialmente aquellos con bajos niveles de condición física.

PALABRAS CLAVE: Paradoja de la actividad física; actividad física ocupacional; intervenciones en el lugar de trabajo; riesgo cardiovascular.

INTRODUCTION

Physical activity (PA) is widely recognized as a mainstay for health promotion and chronic disease prevention, with well-documented benefits on overall well-being and quality of life [1,2]. International guidelines recommend regular aerobic and resistance exercise to optimize cardiovascular and mental health [3,4]. However, recent studies have begun to question this perspective, particularly with regard to

occupational physical activity (OPA) [5-7]. This phenomenon, known as the "physical activity paradox," suggests that PA performed in the occupational context may not offer the same benefits as recreational PA and, in certain cases, may even be associated with health risks [8-10].

Although some studies have indicated that OPA may be associated with increased longevity and reduced risk of certain diseases [11], more recent research presents conflicting findings, raising questions about the actual health effects of OPA [10,12, 13]. A recent meta-analysis identified an increased risk of cardiovascular mortality in workers with high levels of OPA (9). These results underscore the need to reevaluate methodological factors that could be influencing the interpretation of these associations [14].

Clarifying this discrepancy is essential for designing public health policies and improving working conditions [15]. Further analysis of the impacts of OPA on health outcomes could inform new recommendations for healthier work practices [16]. This article aims to examine the relationship between OPA and health outcomes, focusing on differences in intensity, duration, and characteristics of occupational physical exertion, as well as their possible link to increased health risks [5].

From this perspectiva, the objective of this article is to describe, from the existing scientific literature, the effects of occupational physical activity (OPA) on

physical and mental health, in contrast to the benefits of leisure time physical activity (LTPA), and to explore the implications of these findings for occupational health.

Development

The relationship between physical activity and health has been the subject of numerous studies which demonstrate that regular practice is associated with reduced risk of chronic diseases [17-19], such as cardiovascular disease [20], type 2 diabetes [21], and certain types of cancer [22]. These benefits have been particularly documented in the context of leisure-time physical activity (LTPA), which has been linked to improvements in overall health and quality of life [16]. In addition, LTPA contributes to mental well-being [23], by reducing anxiety and depression [24], and improving mood and cognitive function [25]. These findings reinforce the importance of promoting LTPA as a key preventive strategy for disease and overall well-being.

On the other hand, physical activity also takes place in the work environment, manifesting as occupational physical activity (OPA). Unlike LTPA, OPA is usually not voluntary and may involve repetitive activities, intense or prolonged physical exertion, and limited ability to control the intensity and duration of tasks [14]. This lack of autonomy in the work context may make OPA not only less beneficial than LTPA, but in some cases detrimental [9]. The divergence between the effects of LTPA and OPA has given rise to the “physical activity paradox,” a

concept that suggests that demanding physical activity at work does not always improve health and may sometimes increase the risk of health problems [15].

The disparity in health outcomes between LTPA and OPA underscores the need to analyze the context in which physical activity is performed. LTPA is often accompanied by positive factors, such as intrinsic motivation, a controlled environment, and the ability to adjust the intensity and duration of activity according to individual capabilities [26]. In contrast, OPA is generally performed under unfavorable conditions, with little opportunity for recovery and under work pressure, which may increase the risk of injury and chronic disease [9]. Therefore, it is crucial to understand how the environment and characteristics of physical activity affect health outcomes.

The OPA paradox reflects the disconnect between physical exertion at work and the expected health benefits. Although one might intuitively assume that increased physical activity at work is beneficial, multiple studies have shown the opposite [10]. OPA, especially when it includes activities such as heavy lifting or repetitive tasks, has been associated with increased levels of chronic inflammation and increased risk of cardiovascular disease [27]. Chronic inflammation is not only related to the development of serious diseases, but may also reduce life expectancy, highlighting one of the main contradictions of OPA [28].

Another dimension of the paradox manifests itself in the impact of OPA on mental health. While recreational physical activity generally improves mental well-being [25,29], OPA can contribute to deteriorating mental health, with higher rates of anxiety, depression, and work-related stress [30,31]. Constant physical strain, without adequate recovery periods, can result in chronic fatigue, negatively affecting both mental health and quality of life [32]. In addition, work environments that require sustained physical exertion often lack resources to support workers' mental health, exacerbating the negative effects of OPA [33].

Understanding the OPA paradox is essential for developing interventions to mitigate the adverse effects of physical activity at work. It is critical to recognize that not all forms of physical activity are equally beneficial and that the context in which they are performed plays a crucial role in health outcomes [34]. In this sense, occupational health programs should be designed to address specific risks, considering both physical demands and psychosocial factors that may influence workers' health [9,14].

One of the risks of OPA is increased systemic inflammation, a key factor in the development of chronic diseases, including cardiovascular disease and certain types of cancer [27]. Chronic inflammation, caused by repetitive and prolonged physical exertion without adequate recovery, can damage cells and tissues, contributing to the development of serious diseases and increasing the risk of mortality [35]. Studies have shown that

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workers in high-intensity occupational activities, such as heavy lifting, have higher levels of inflammatory markers, indicating an increased risk of long-term health complications [36].

This increase in inflammation levels is also reflected in mortality rates. Unlike LTPA, which has been consistently associated with a reduction in all-cause mortality [37], OPA does not show the same protective relationship. In fact, some studies have found that elevated levels of OPA may be linked to increased mortality from cardiovascular disease, particularly in men [10].

Comparison of Health Outcomes in Different Occupational Groups

Differences in health outcomes among various occupational groups highlight the complexity of how physical activity affects workers in different contexts. Although employees in physically demanding jobs, such as laborers or construction workers, tend to spend less time in sedentary activities, this does not necessarily translate into better cardiometabolic health outcomes. In fact, these workers often have similar or even higher levels of cardiometabolic risk compared to those in less physically demanding occupations, such as office jobs [38]. This paradox may be explained, in part, by the type and context of physical activity performed in the work environment, which does not provide the same benefits as physical activity performed during leisure time [25].

In contrast, office workers, who generally experience higher levels of sedentary

lifestyles due to the nature of their tasks, can mitigate these negative effects by engaging in moderate to vigorous physical activity in their free time [32]. Despite being exposed to long periods of inactivity during their workday, this group often shows better outcomes on health indicators such as blood pressure, body mass index (BMI), and cardiovascular function compared to their counterparts in physically demanding jobs [39]. These findings highlight the importance of leisure time physical activity (LTPA) in counteracting the adverse effects of occupational sedentary lifestyles, demonstrating that the quality and context of physical activity are more important determinants of health than the sheer quantity of physical activity [40].

In addition to differences in physical health, mental health conditions have also been identified among different occupational groups. Workers in jobs that require high levels of occupational physical activity (OPA) not only face greater physical risks, but also greater deterioration in mental health, including higher rates of depression and anxiety [41]. The repetitive and often monotonous nature of these jobs, coupled with constant physical pressure, can contribute significantly to stress, exacerbating mental health problems that affect the overall quality of life of these workers [42]. These findings reinforce the need to implement intervention strategies that address both physical and mental health in the work environment, tailored to the specific demands of each occupation [43].

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Workplace Interventions: A Possible Solution

Workplace interventions have been proposed as a strategy to mitigate the negative effects of occupational physical activity (OPA). Physical activity programs that include regular exercise during the workday have been shown to be effective in improving workers' quality of life, reducing the frequency and intensity of pain, and preventing work-related diseases [(44)]. When implemented consistently, these programs can counteract the adverse effects of OPA by providing opportunities for rest and active recovery, which are fundamental to preserving long-term health [(45)].

Specific interventions such as yoga and have been shown to be particularly effective in reducing stress among healthcare workers, a particularly vulnerable group due to the high physical and emotional demands of their work [(46)]. These programs not only address physical health, promoting flexibility and strength, but also focus on mental health, helping workers to manage stress and improve their overall well-being [(47)]. However, not all interventions have been equally successful. General workplace physical activity programs have shown mixed results, suggesting that the effectiveness of these interventions depends largely on their design and how they are tailored to the specific needs of workers [(48)].

In addition, the physical configuration of the work environment plays a key role in promoting physical activity [(49-50)]. Designing offices and workspaces that

encourage movement, such as using adjustable desks for standing work or creating walking areas, can increase daily physical activity and reduce total time spent sitting, which is beneficial for cardiovascular and metabolic health [51]. This "active design" approach not only improves physical health but can also have a positive impact on productivity and job satisfaction, demonstrating that workplace interventions must be comprehensive and tailored to the specific characteristics of each occupation to be truly effective.

CONCLUSION

The paradox that increased physical activity in occupational tasks does not guarantee better health is supported by evidence showing that high OPA can lead to adverse health outcomes, including increased inflammation, increased mortality risks, and poor mental health. In contrast, LTPA consistently provides important health benefits.

Evidence suggests that physical activity in the workplace does not necessarily improve health and, in some cases, may be associated with adverse effects, especially in physically demanding jobs. Therefore, while promoting physical activity is crucial, it is essential to differentiate between types of physical activity and their contexts. Tailored interventions that promote LTPA and control the intensity of RPA are necessary to optimize workers' health outcomes.

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