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SYSTEMATIC REVIEW

Use of physiological indicators as determinants of physical aptitude in work environments in Latin America: a systematic review

Uso de indicadores fisiológicos como determinantes de aptitud física en entornos laborales de América Latina: una revisión sistemática

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ABSTRACT

The use of physiological indicators to evaluate physical aptitude in the workplace is essential to ensure the health and well-being of employees, in addition to optimizing their performance. This descriptive and comprehensive research with the objective of exploring researches carried out in Latin America on the evaluation of physical abilities through physiological indicators in work environments during the period 2019-2023. A systematic review of the scientific literature was carried out, using the PICO (Population, Intervention, Comparison, and Outcome) strategy. The search covered recognized databases such as PubMed, Scopus, Web of Science and SciELO, and was carried out in three languages (English, Spanish and Portuguese). Research was included that evaluates indicators such as aerobic capacity, heart rate, and muscle strength in employees from different economic sectors in the Latin American work context. The studies were selected according to the defined inclusion and exclusion criteria identified patterns, methods and findings on physiological indicators and physical fitness, concluding that their usefulness is not questionable, allowing the intensity and physical workload of work to be estimated, as well as determining the activity times and contribute as a biomarker in ergonomic interventions.

Keywords: Aerobic Capacity; Heart Rate; Muscle Strength; Physical Aptitude; Workers; Latin-American.

RESUMEN

El uso de indicadores fisiológicos para evaluar la aptitud física en el trabajo es esencial para garantizar la salud y el bienestar de los empleados, además de optimizar su rendimiento. Esta investigación descriptiva e integral tuvo como objetivo explorar las investigaciones realizadas en Latinoamérica sobre la evaluación de las capacidades físicas mediante indicadores fisiológicos en entornos laborales durante el período 2019-2023. Se realizó una revisión sistemática de la literatura científica mediante la estrategia PICO (Población, Intervención, Comparación y Resultado). La búsqueda abarcó bases de datos reconocidas como PubMed, Scopus, Web of Science y SciELO, y se realizó en tres idiomas (inglés, español y portugués). Se incluyeron investigaciones que evalúan indicadores como la capacidad aeróbica, la frecuencia cardíaca y la fuerza muscular en empleados de diferentes sectores económicos en el contexto laboral latinoamericano. Los estudios se seleccionaron según los criterios de inclusión y exclusión definidos, se identificaron patrones, métodos y hallazgos sobre indicadores fisiológicos y aptitud física, y se concluyó que su utilidad es incuestionable, ya que permite estimar la intensidad y la carga física del trabajo, así como determinar los tiempos de actividad y contribuir como biomarcador en intervenciones ergonómicas.

Palabras clave: Capacidad Aeróbica; Frecuencia Cardíaca; Fuerza Muscular; Aptitud Física; Trabajadores; Latinoamericanos.

INTRODUCTION

Physical activity is considered a fundamental component for the development and maintenance of health in individuals.[1,2] Regardless of age, being physically active improves quality of life and provides both physical and mental well-being.[3] Maintaining an active lifestyle helps prevent the onset of chronic diseases, which are quite common in today's adult population. However, despite the extensive knowledge about the positive effects of physical activity on health, inactivity has become one of the leading risk factors for mortality due to non-communicable diseases, according to the World Health Organization.[4]

Physical fitness is defined as the body's ability to perform physical activities efficiently and with minimal fatigue. This capacity is influenced by several factors, including age, sex, lifestyle, and environment.[5,6] Physical fitness not only affects the ability to perform daily tasks but also plays a crucial role in overall health and mental well-being. Regular exercise has been shown to improve emotional stability and reduce symptoms of depression and anxiety.[7] In the Latin American population, a region that has undergone a well-documented epidemiological transition and faces an obesity epidemic, there is relatively little research about physical activity and fitness.[8]

Physiological indicators are objective measures that reflect the functioning of the human body's systems, such as the cardiovascular,[9,10] respiratory, and musculoskeletal systems. These indicators can be measured through specific tests and provide valuable information about a person's physical capacity.[11,12,13] Similarly, they are powerful tools for assessing workers' physical fitness and, consequently, optimizing their performance and preventing injuries in workplace settings. In Latin America, where the workforce often faces demanding working conditions, the use of these indicators becomes even more relevant.[11,13]

The assessment of these physiological indicators is essential for determining workers' physical fitness, especially in work environments where health and performance are crucial. These indicators not only reflects workers' physical condition but are also related to injury prevention and increased productivity.[11,13,14]

Most commonly used physiological indicators

- Maximal heart rate: represents the maximum number of beats per minute that the heart can reach during maximal exertion.[15,16]
- Maximal Oxygen Consumption or Volume (VO2 max): measures the maximum amount of oxygen the body can utilize during exercise. It is a key indicator of aerobic capacity.[15,16]
- Muscular strength: assessed through tests such as dynamometry, which measures the maximum force a muscle can generate.[15,16,17]
- Flexibility: measured through tests such as the sit-and-reach test, which evaluates the flexibility of the lower part of the body.[15,16]
- Body composition: evaluated using methods such as bioelectrical impedance or skinfold thickness, which help determine the proportion of muscle mass, fat, and water in the body.[15,16]

The ability to perform heavy aerobic tasks depends both on maximal oxygen intake (aerobic power) and the ability to sustain a high level of oxygen transport and consumption over time (aerobic capacity). Aerobic power declines steadily throughout the working life. The decline in sustained aerobic capacity is less documented but is likely greater than that of aerobic power, as the ability to dissipate metabolic heat decreases and the tone of venous reservoirs also diminishes with age.

A person with weak muscles is limited to a smaller fraction of their maximal oxygen intake, increasing their level of disability. However, much also depends on motivation, and high percentages of aerobic power can be maintained both during a workplace emergency and in a sports competition. The implications for industry are further complicated by interindividual differences in the energy cost of specific tasks and in the work structure of a typical day.[18,19,20]

"Heavy" tasks may occupy only a small fraction of an eight-hour shift, but these components are typically measured when estimating the energy cost of work. An increase in body mass raises the metabolic cost of any task that involves moving body weight, but this potential disadvantage in older individuals is offset by accumulated experience and the resulting improvements in mechanical efficiency.[18,19,20]

The possible consequences of excessive aerobic demand include fatigue, as well as the risk of a heart attack or stroke. Exercise-induced increase in blood pressure is proportional to relative cardiovascular and muscular loads; in an elderly worker, the relative load, and therefore heart rate and stress on weakened blood vessel, is greater than in a young person. However, in practice, complaints of fatigue are rare, even among older female employees, and the incidence of heart attacks does not appear to be particularly high during normal working hours.[20,21,22]

Maximum muscular strength remains relatively constant until around the age of 40; there is a slight decline between 40 and 65 years, followed by an accelerated loss of strength thereafter: this reflects a reduction in muscle fiber cross-sectional area, selective atrophy of the most powerful fast-twitch fibers, and less effective

activation, resulting in decreased maximal strength per unit of muscle cross-section. The rate of strength loss varies considerably between muscle groups, which makes difficult the assessment of an individual's overall function with a single test, such as measuring maximum handgrip strength. At all ages, women have only about 65 % of the strength of men, making them more likely to be disabled by strength loss as they age. In many tasks, body mass is needed to be moved, which increases the relative demand on individuals who have become obese.[2,23,24,25]

In jobs that require frequent lifting and carrying of loads, the physical demands of the workplace should have maintained muscular strength at its potential. The immediate consequences of inadequate muscular strength may include the inability to complete an occupational task without assistance and an increased susceptibility to suffer from lifting-related injuries. However, surprisingly, there is little correlation between age and the incidence of lifting injuries.[2,23,24,25]

Importance in workplace settings

- Workload measurement: physiological indicators, such as heart rate, can be used to assess physical workload, physical demands, and determine the maximum acceptable work duration.
- Risk assessment: they help identify workers who may be at higher risk of suffering injuries due to biomechanical factors such as repetitive strain or overload, enhancing ergonomic workplace evaluations.[26]
- Training program design: they allow physical training programs to be tailored to each worker's specific needs, improving performance and preventing injuries.
- Health monitoring: they facilitate tracking the evolution of workers' physical condition over time.
- Justification for workplace adaptations: they can serve as evidence to request workplace adaptations if a worker has physical limitations.

Challenges and considerations in Latin America

- Access to equipment and professionals: in many regions of Latin America, access to measurement equipment and trained professionals to conduct these assessments may be limited.[26,27,28]
- Cultural and socioeconomic factors: cultural and socioeconomic factors can influence the perception of the importance of physical fitness and workers' willingness to participate in evaluation programs.[26,27,28]

According to a CDC report, "Racial and ethnic disparities in physical inactivity highlight the need to address barriers to physical activity. Some examples include the lack of safe spaces for physical activity, such as parks, unsafe streets with high-speed traffic and no sidewalks, lack of time, and lack of social support". Latino immigrants also have more probabilities to work in labor-intensive jobs that are often performed outdoors, such as agriculture or construction. These physically demanding jobs can lead to increased inflammation and chronic injuries, which may reduce the ability to exercise outside of work.[29]

Overweight is one of the most pressing health risk factors in Latin America and the Caribbean. The average body mass index (BMI) increased between 2000 and 2017, reaching 26,9 for men and 28,3 for women, above the overweight threshold of 25 and approaching the obesity threshold of 30.[30]

Objectives

General objective: evaluate the impact of the use of physiological indicators in the determination of physical fitness in workplace settings in Latin America.

Specific objectives

1. Identify the most commonly used physiological indicators in workplace studies in Latin America.
2. Analyze the relationship between these indicators and workers' health.

METHOD

Delimitation of the topic and research question

For the development of this review, the following PICO framework was used:

- Population (P): workers in Latin America.
- Intervention (I): use of physiological indicators (such as heart rate, aerobic capacity, muscular strength, etc.) to assess physical fitness.
- Comparison (C): comparison with other physical fitness assessment methods or the absence of physiological indicators.
- Outcome (O): effects on workers' health, productivity, and overall well-being.

Search procedure

This review followed the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-

Analyses (PRISMA) 2020. Manual searches were conducted in 15 databases (PubMed, Scopus, Web of Science, Scielo, PsycINFO, ScienceDirect, Cochrane, Latindex, and LILACS), four preprint servers (SocArXiv, bioRxiv, and medRxiv), and other search engines such as Dimensions, Google Scholar, Yahoo!, and Alicia CONCyTec (a Peruvian thesis repository) in November 2024.

The database search strategy was carried out using the following search equation: ((“physiological indicators” OR “workplace well-being”) AND (“physical fitness” OR “occupational health”) AND (“productivity” OR “well-being”)). The search query was adapted for each scientific search engine, and translations into English and Portuguese were used when searching on platforms such as Google Scholar, LILACS, Scielo, Yahoo!, and Alicia CONCyTec.

Study selection

Inclusion and exclusion criteria

- Study types: clinical trials, observational studies (cohort, case-control), and systematic reviews were included. Opinion articles, editorials, and studies without a clear design were excluded.

Population

- Inclusion: adult workers (18–65 years) in any labor sector in Latin America.
- Exclusion: studies including special populations (athletes, individuals with disabilities, etc).

Interventions

- Inclusion: studies evaluating the use of physiological indicators as part of occupational health programs or interventions related to workplace well-being.
- Exclusion: studies that do not use physiological indicators or focus exclusively on non-physiological interventions.
- Languages: English, Spanish, and Portuguese.
- Publication date: from January 2014 to November 2024.

Data extraction

A form was applied to systematically collect relevant information from each study (author, year, study design, population, evaluated indicators, results, etc.). A double review of the extracted data was conducted by two independent reviewers to minimize errors.

RESULTS

The electronic database search using descriptors and Boolean operators yielded a total of 254 entries. After excluding duplicate records[56], 198 abstracts were reviewed. Of these, 176 were not considered because they evaluated the target indicators in non-relevant populations or samples.

A total of 22 publications were left, which were further assessed individually based on title and abstract. It was possible to retrieve 100 % of these articles to decide their eligibility. However, 16 publications were excluded for several reasons: 11 studies did not include subjects from the target geographic area, 3 studies did not include the desired physiological indicators, 2 studies did not describe their methodology for evaluating the indicators. Finally, a total of six (6) studies were available for the qualitative synthesis of this review.

The flow diagram followed for the selection of the review studies, as suggested by the PRISMA statement (Preferred Reporting Items for Systematic reviews and Meta-Analyses)[31] is presented in figure 1. The studies retrieved for the qualitative synthesis evaluated the indicators under study in this review as a secondary aspect González-López to the achievement of their objectives, none of them studied the intrinsic value of the indicators as markers of physical fitness.

There was considerable heterogeneity in the types or methodological designs of the studies. Of the total six (6), two (2) were randomized clinical trials,[8,31] one[31] of which had a preference for patients; two (2) were observational studies with an epidemiological focus[19,32] aimed at the detection of risk factors; one was a prospective cohort study[33] and the remaining one was a quasi-experimental study.[34] It was found that three[8,35,36] (3) of the retrieved studies were conducted directly in Latin American countries, while the others were carried out in Latino immigrant populations in the United States[34,35] and Spain.[32]

100 % of the reviewed studies used Body Mass Index (BMI) as one of the physical fitness indicators in the studied samples. Additionally, 50 % measured body fat and/or muscle mass percentages.[8,34,36] The same proportion[8,34,36] used maximal oxygen volumen (VO2 máx) as a measure of aerobic fitness. The studies by D´Alonzo et al.[34]; González et al.[32] and López et al.[33] assessed physical activity levels using different scales. D´Alonzo et al.[34] also used muscle strength and flexibility as physical fitness indicators. Two (2) studies reported the use of blood pressure measurements in their methodology,[8,35] while a third study[36] also presented this indicator in its results. Table 1 summarizes the characteristics of the included studies.

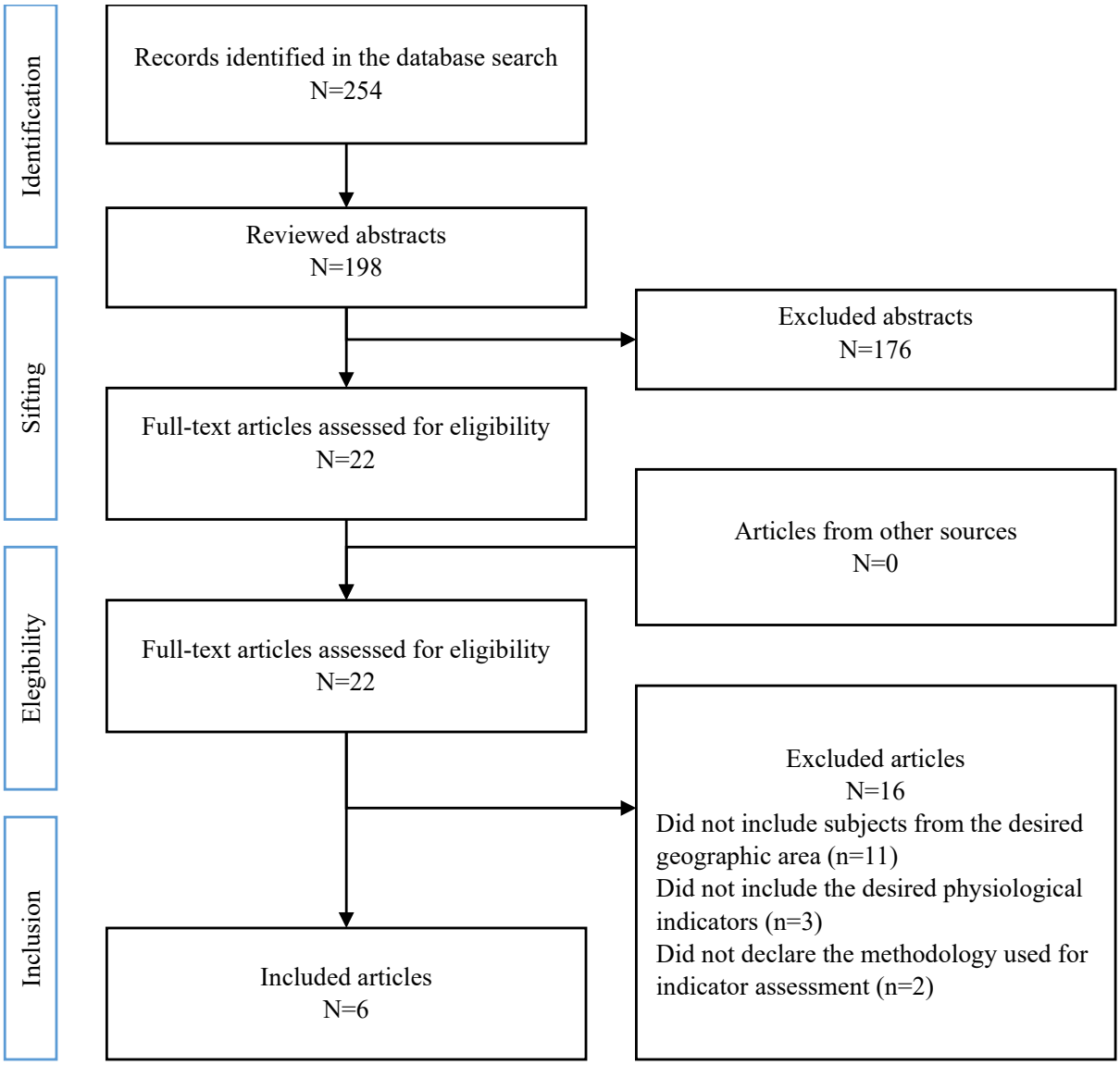

Figure 1. Flow diagram of identified, excluded, and included studies according to PRISMA[31]

Table 1. Summary of data extracted from the included studies

No.	Author	Study design	Population	Indicators used	Results
1	[36]	Cross-sectional observational study with an epidemiological approach	121 teachers and workers from the Higher Polytechnic School of Chimborazo, Ecuador.	Body Mass Index (BMI) Percentages of body fat and muscle mass using the InBody system VO_2 through a maximum exercise test on a treadmill. Blood pressure (not declared in methods, but reported in results).	No significant differences in indicators before and after the intervention with physical exercise were observed.
2	[8]	Randomized clinical trial	20 adults from Bogotá, Colombia.	BMI Percentages of body fat and muscle mass using the Tetrapolar Bioelectrical Impedance Analysis (BIA) system VO_2 through a maximum exercise test on a treadmill, following the modified Balke protocol. Blood pressure using an oscillometric electronic device.	No significant differences between groups in rMSSD, HF, and LF parameters were observed. In inactive adults, this study showed that a 12-week HIT training program could increase short-term heart rate variability, mainly in vagus-mediated indices such as the power of the relation SDNN and HF/LFLn.

3	[34]	Partially randomized patient preference trial with a delayed group for testing the intervention.	76 Latina immigrant women, Spanish-speaking, aged 18 to 55, West Coast, USA.	Physical activity level: self-assessment using a 7-point scale. BMI Body fat percentage: it used the portable Omron HBF-306 model for measuring arm-to-arm impedance. Aerobic fitness: VO_2 Muscular strength: number of sit-ups that an individual can perform in 1 minute. Flexibility: test that uses a Sit-and-Reach box, measures flexibility in hamstrings, paraspinals, and calves; used as an indirect measure of general flexibility.	Se midieron mejoras significativas en la aptitud aeróbica, la fuerza y la flexibilidad muscular y los niveles diarios de actividad física (p <0,001).
4	[32]	Cross-sectional observational study with an epidemiological approach	A representative sample of 190 Latin American immigrants aged 25 to 44 living in Seville, Spain.	BMI, with the protocol utilized in the DORICA Study. Physical activity: weekly frequency of physical activity; reported as none, once, twice, three times, or more than three times a week during the week prior to the survey.	In the combined group, the most frequently reported work-related physical activities were standing or sitting (n = 92, 64,8 %), followed by transporting light loads and frequently climbing stairs or slopes (n = 23, 16,2 %). In the combined group, the proportion of participants that reported standing or sitting as the most common work activity was much higher in women than in men.
5	[33]	Prospective cohort study	24 718 participants from 51 urban and 49 rural communities in Argentina, Brazil, Chile, and Colombia.	BMI Abdominal obesity: defined as a waist-to-hip ratio (WHR) of 0,9 for men and 0,85 for women. Physical activity: measured using the International Physical Activity Questionnaire.	Chile had the lowest levels of physical activity and grip strength, and the highest prevalence of abdominal obesity. In men, physical activity was lower. Low physical activity levels were more common in urban areas.
6	[35]	Quasi-experimental study	66 Latino immigrant agricultural workers, aged between 18 and 64 years old.	BMI Blood pressure	24 workers met criteria as at cardiovascular risk. The ability to identify individuals at risk for suffering heart disease or diabetes will further enhance the impact that the CHW has on population health.

DISCUSSION

This systematic review was conducted with the general objective of evaluating the impact of using physiological indicators in the determination of physical fitness in workplace settings in Latin America. The limited literature retrieved on this topic could be considered an initial indication of the need for and relevance of further research in this area.

A significant heterogeneity was observed in the indicators used across the reviewed studies. In this regard, it is important to take into account that the retrieved studies were not aimed at achieving similar objectives, which is reflected in the differences in their methodological designs. Therefore, it is understandable that the indicators used by the authors of each study were designed to meet their specific needs. This severely hindered the comparison between the usage of indicators, although the widespread use of Body Mass Index (BMI) could be proved.

Collectively, studies were observed that included samples of subjects from Latin America, outside this geographical context, such as North America and Europe. The disparity observed between studies conducted in

Latin America and those in developed countries is a complex phenomenon influenced by multiple interrelated factors. Beyond differences in the object and objectives of the studies, research in the Latin American context often prioritizes more pressingly local public health issues, infectious and endemic diseases, non-communicable diseases, among others; placing occupational health in the background. The extreme ethnic heterogeneity of Latin American populations, along with geographical, socioeconomic, and linguistic barriers, are other factors that hinder the development of these studies. As a result, a series of biases are introduced into the scientific body of knowledge, either due to a lack of evidence or publication. The phenomenon of international migration continues to play a crucial role in the global labor market, representing 4,7 percent of the workforce in 2022, according to the latest report from the International Labour Organization.[37]

Unfortunately, migrant workers are predominantly placed in a category known as "4-D jobs" dirty, dangerous, and difficult. Discriminatory: recently, a fourth "D" has been added to identify the discriminatory aspect, in addition to other social determinants of health that migrant workers face in their host countries while being exposed to precarious working conditions. The growing presence of Latin American immigrants across various continents has drawn the attention of authorities, who can contribute to the study of these emerging population sectors, these workers often face economic inequalities that expose them to greater health risks, while necessary protective measures are frequently lacking. In consequence, migrant workers face a significant risk of developing work-related diseases and injuries, further aggravated by the fact that their health needs are often overlooked.[37]

The indicators used in the reviewed articles offer several advantages over others, especially in epidemiological studies of Latin American workers. First, they have a well-established direct relationship with health status. Second, they are easy to measure using relatively accessible equipment, such as treadmills, dynamometers, and skinfold calipers, facilitating their implementation in large-scale studies; additionally, standardized protocols exist for their measurement, allowing for better comparability of results among different studies. Third, these indicators are relevant to occupational health, as they are directly related to the physical demands of many jobs and they can help identify workers at risk of injuries or occupational diseases and assess the effectiveness of intervention programs aimed at improving workers' health and performance. Fourth, they are used in various epidemiological studies, both in general populations and specific occupational groups, making it easier to compare results from studies conducted in different countries and regions.

In the Latin American context, where there is a high prevalence of chronic diseases, demanding working conditions, and ethnic and cultural diversity, these instruments prove to be reliable and robust, they are more objective than self-reports on physical activity or health perception, more specific and precise in identifying risk factors, and more effective in predicting the risk of developing future diseases.

Physical activity level

Physical activity refers to any bodily movement produced by skeletal muscles that results in energy expenditure, and it can be measured using various scales and questionnaires. One of the most used tools is the International Physical Activity Questionnaire (IPAQ), which classifies activity into four domains: occupational, domestic, transportation, and leisure-time. This questionnaire allows individuals to be categorized into different physical activity levels, which can be dichotomous (inactive/active), ordinal (sedentary/moderately active/active), or continuous (measured in METs or kilocalories).[38]

In the workplace, promoting physical activity provides significant benefits for both employees and companies. The World Health Organization (WHO) recommends at least 150 minutes of moderate activity or 75 minutes of vigorous activity per week to maintain good health.[39] Implementing workplace physical activity programs can improve cardiovascular health, reduce the risk of chronic diseases such as type 2 diabetes and certain types of cancer, and enhance productivity and job satisfaction.[39] Additionally, companies that encourage active lifestyles among their employees have been shown to experience reduced absenteeism and a positive economic return.[7]

Assessing physical activity levels in workplace settings also involves both objective measures (such as accelerometers) and subjective measures (questionnaires), providing a deeper understanding of workers' physical condition.[40] These assessments are essential for designing effective interventions that promote healthy habits in the workplace.

Body fat and muscle mass percentage and abdominal obesity

Body composition, which includes both muscle mass and fat mass, plays a crucial role in an individual's physical capacity, directly influencing work performance and overall well-being. A high percentage of fat mass is associated with decreased cardiovascular capacity and muscle endurance. Studies have shown that a higher percentage of body fat can reduce efficiency in physical activities, negatively affecting performance in tasks requiring strength and endurance.[41,42] For instance, a negative correlation has been found between body fat percentage and performance in jump tests, suggesting that higher body fat leads to a lower ability to perform such activities.[41]

Conversely, a higher percentage of muscle mass is linked to better capacity to generate strength and carry out physical activities more efficiently. This is particularly relevant in occupational settings that require physical exertion. Muscle mass not only contributes to strength but also improves metabolic health, reducing the risk of chronic diseases such as type 2 diabetes. The relationship between greater muscle development and improved physical fitness can translate into reduced absenteeism and increased productivity.[7]

Workers with an adequate balance between muscle mass and body fat tend to have better overall health, which may lead to fewer sick days and an enhanced ability to meet the physical demands of their jobs.[43,44] Additionally, maintaining a healthy body composition can contribute to higher job satisfaction and psychological well-being.[7]

Aerobic fitness

Aerobic fitness is a measure of the human body's ability to perform prolonged physical activities using oxygen as the primary energy source. This capacity is not only essential for athletic performance but also has a significant impact on overall health and well-being in the workplace.[45]

One of the most common ways to assess aerobic fitness is through maximal oxygen volume VO2máx. This parameter indicates the maximum amount of oxygen the body can absorb, transport, and utilize during intense exercise, typically expressed in milliliters of oxygen per minute per kilogram of body weight (ml/min/kg). A higher VO2máx is associated with better cardiovascular capacity and greater physical endurance. To determine it, direct methods such as laboratory tests with an ergospirometer can be used, as well as indirect methods, including the Cooper Test, which measures the distance covered in a given time.[46,47,48]

The relationship between aerobic fitness and workplace performance is significant. Workers with good aerobic capacity tend to experience less fatigue and maintain higher energy levels throughout their workday. This translates into increased productivity and efficiency in daily tasks. Additionally, regular exercise that enhances aerobic fitness can contribute to improved cognitive function and mental clarity, which are essential for decision-making and problem-solving at work.[7]

From an occupational health perspective, maintaining good aerobic fitness can help prevent chronic diseases, improve mental health, and reduce workplace stress. Studies have shown a significant difference in aerobic capacity between active and sedentary workers; those who regularly engage in physical activity have a higher VO2máx, allowing them to better handle the physical demands of their jobs.[49,50] Therefore, promoting workplace physical exercise programs not only benefits employees individually but can also lead to a healthier and more productive work environment.[7]

Muscular Strength

Muscular strength is defined as the ability of a muscle or group of muscles to exert tension against a load during its contraction. It is essential not only in the sport field, but also in daily life and the workplace, where muscular strength can influence both productivity and overall workers' health. According to existing literature, it seems it is possible that there is no substitute for greater muscular strength when it comes to enhancing an individual's performance across a wide range of general and sport-specific skills, and, at the same time, reducing the risk of injury when performing these tasks.[51]

Muscular strength can be classified as

- Maximum strength: the greatest amount of force a muscle can generate in a single contraction; it is crucial for activities that require lifting heavy objects.
- Explosive strength: it enables to carry out rapid and powerful movements, such as jumping or sprinting; this is important for activities that demand speed and agility.
- Muscular endurance: the ability of muscles to perform prolonged efforts without fatigue; it is essential for activities requiring endurance, such as running long distances or performing repetitive tasks at work.

The types of strength are interdependent, and their development can enhance an individual's functional capacity as well as their overall physical performance.

Measurement of Muscular Strength

Scientists and sports professionals can monitor a person's strength through tests and variables of isometric, dynamic, and reactive strength.[51]

Lifting tests: these include exercises such as the bench press or squats, where the maximum weight a person can lift in a single repetition is measured.

Dynamometry: it uses a dynamometer to measure the force applied by a muscle or muscle group during a contraction.

Electromyography (EMG): this technique measures the electrical activity of muscles during different exercises, providing data on how muscle fibers are activated.[48,52]

Muscular strength is a decisive indicator in biomechanical assessment, as low muscular strength is a risk factor for musculoskeletal injuries. An adequate level of muscular strength helps prevent injuries. Strong muscles protect the joints and reduce the risk of injuries when performing physical tasks. Adequate muscular strength allows workers to perform their tasks more efficiently and with less fatigue, which can lead to increased productivity.[53,54] In general, strength training is associated with benefits such as improved bone density, reduced risk of chronic diseases; better metabolic health, and contributes to quality of life, especially in older ages, by preventing sarcopenia and loss of mobility.[55,56,57]

Flexibility

Flexibility is an essential physical capacity that refers to the range of motion of the joints and the elasticity of the muscles. Various techniques are used to assess flexibility, that measure the range of motion of the joints: static stretches, where a fixed position is maintained to assess passive flexibility; dynamic stretches, involving active movements that maximize the range of motion; and functional tests such as the "Sit and Reach" test, which measures the flexibility of the lower back and hamstrings.[58]

The promotion of physical fitness in the workplace is crucial not only for improving employees' individual health but also for enhancing organizational efficiency.[7,59,60]

There is a notable scarcity of specific studies in Latin America that analyze the impact of indicators on occupational physical fitness. Most of the research has been conducted in dissimilar contexts, with non-representative populations, and used some of the indicators interchangeably to draw conclusions about the health status of the sample/population under study, not focusing on the evaluation of the value of the indicator itself as a biomarker, which limits the possible analyses or comparisons that could be made. This creates the need for more research with the aforementioned focus.[61,62,63]

CONCLUSIONS

The use of physiological indicators as determinants of physical fitness in occupational settings in Latin America is crucial for promoting a healthy and productive environment. The review conducted highlighted the lack of evidence regarding the use of physiological indicators to determine physical fitness in the labor context of Latin American workers. The widespread use of body mass index (BMI) was observed for this purpose. Although BMI is a useful indicator in public health field and preventive medicine, its use has been criticized due to its inability to differentiate between muscle mass and body fat, which may lead to misinterpretations in certain groups, such as athletes. Meanwhile, indicators such as maximum oxygen volume and physical activity level, which have a greater impact on assessing work physical capacity and preventing musculoskeletal injuries, are less commonly applied. The evaluation and improvement of muscular strength in workers is essential to prevent musculoskeletal injuries and optimize work performance. The diversity and variability of working conditions in Latin America hinder the standardization of assessments. The effective implementation of programs that promote physical activity not only benefits workers individually but also has a positive impact on the organization as a whole, improving both occupational health and organizational climate. However, it is crucial to address the existing challenges to ensure the successful implementation of these tools.

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CONFLICT OF INTEREST

Authors declare that there is no conflict of interest.

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