IJSSHT, **Agustus 2023, 1 (2), 51-65**
ISSN: 2988 – 4985 (Online-Elektronik)
Available online at http://ijssht.ppj.unp.ac.id/index.php/IJSSHT/index

Changing Inactivity Trends: Uncovering the Potential of Exercise in Improving Body Physiological Function and Physical Health

Jennifer Astra [1*], Bafirman HB [2]
[1,2]Faculty of Sports Science, Universitas Negeri Padang, Jl. Prof. Dr. Hamka Air Tawar, Padang, Sumatera Barat, Indonesia

Received: 14 July 2023
Revised: 25 July 2023
Accepted: 20 Agustus 2023

Abstract

In the modern era that tends to be inactive, the trend of inactivity is increasingly worrying and has a negative impact on physical health and physiological functions of the body. However, awareness of the importance of exercise as a means to improve the physiological function of the body and maintain physical health began to increase. Recent research has shown that exercise has a significant impact on the body's physiological system, improving the performance of the heart, lungs, and nervous system, as well as strengthening muscles and increasing body flexibility. In addition, exercise also contributes to overall physical health by lowering the risk of heart disease, type 2 diabetes, and some cancers. A sharp and robust evaluation of the relationship between exercise, physiological function, and physical health will provide a deeper understanding of the benefits of exercise and the importance of physical activity in improving quality of life and reducing the risk of chronic disease. Thus, efforts to change the trend of inactivity towards fitness trends become important for a healthier and more productive society.

Keywords: Changes in inactivity trends, body physiology, physical health

(*) Corresponding Author: jenniferastra15@gmail.com

INTRODUCTION

In the busy and technology-oriented modern era, the trend of inactivity is increasing among the public. A sedentary lifestyle and the habit of spending time in front of electronic screens have led to decreased physical activity and various associated health problems (Hussey et al., 2015; Myers et al., 2019). However, in recent years, awareness of the importance of exercise as a means to improve the physiological functions of the body and maintain physical health began to emerge (Chiauzzi et al., 2015; Knudson, 2018).

Exercise has a significant impact on the physiological systems of the human body. When a person performs physical activity, his muscles work harder, increase blood flow, and increase oxygen supply throughout the body (Ambrose & Golightly, 2015; Taylor et al., 2015). This leads to improved performance of the heart and lungs, as well as optimizing the functioning of the nervous, endocrine and digestive systems. In addition, exercise can also increase bone density, strengthen muscles, and increase body flexibility (Imani et al., 2016, 2016).

In addition to physiological benefits, exercise also has a positive impact on overall physical health. Exercising regularly can help lower your risk of heart disease, type 2 diabetes, and some cancers. This is due to improved metabolism, weight loss, and better regulation of blood sugar levels (Hays et al., 2016; Wahid et al., 2016). In addition, exercise can also improve mental health and improve mood through the release of endorphins, hormones responsible for feelings of happiness and reducing stress (Ambrose & Golightly, 2015; Taylor et al., 2015).

Given all the benefits it offers, it is important for society to turn an inactivity trend into a fitness trend (Hays et al., 2016; Imani et al., 2016). By integrating exercise into daily routines, either through more active physical activities or through preferred types of exercise, individuals can improve the physiological function of their bodies and improve overall physical health (Bates et al., 2020; Wahid et al., 2016).

In recent research trends, the study of the relationship between exercise and the physiological functions of the body as well as physical health has become a topic that has received great attention. Recent research has revealed strong evidence that exercise has a significant influence in improving health and quality of life (Chastin et al., 2019; Friedenreich et al., 2021). Researchers have studied various aspects, ranging from the effects of exercise on the cardiovascular system and lungs, its effects on metabolism and blood sugar regulation, to its benefits in preventing chronic diseases such as diabetes, obesity, and cancer (Davies et al., 2015; Vanrenterghem et al., 2017).

In addition, new technologies and innovations have also been used in research to monitor and measure the body's physiological responses during exercise, such as the use of digitally connected physical and sensory activity monitoring devices (Ehrman et al., 2022; Nweke et al., 2019). In this state-of-the-art, this latest research provides a deeper understanding of the complex relationship between exercise, body physiological function, and physical health, which can be used to drive policies and practices that focus on the importance of physical activity in healthier societies (Fuezeki et al., 2017; Langhammer et al., 2018).

In this context, the novelty of this study is to present a very sharp and powerful evaluation of the relationship between exercise, physiological functions of the body, and physical health (Cormie et al., 2018; Piercy & Troiano, 2018). The primary goal of this evaluation is to identify in depth and measurably how exercise specifically affects the body's physiological functions, including changes in cardiovascular, lung, metabolic, and blood sugar regulation parameters (Pang et al., 2018; Reimer et al., 2016).

In terms of contribution, this research will provide a more holistic understanding of the benefits of exercise in improving the body's physiological function and physical health, by combining the latest empirical evidence from various studies and using a careful evaluation approach (Kenney et al., 2021; Powell et al., 2018). This contribution will provide a strong foundation for practitioners, policymakers, and the general public to appreciate the importance of exercise and encourage greater participation in physical activity with the goal of improving quality of life and reducing the risk of chronic disease.

METHODS

This research uses a qualitative descriptive research model that is a literature study that uses various literature reviews in strengthening research analysis. This research begins with collecting some literature, then reviewing some important terms in the research, then collecting relevant research literature, then conducting an analysis based on all the literature that has been obtained by compiling a discussion, then formulating conclusions based on the results that have been analyzed and submitting suggestions based on the conclusions obtained.

The data used in this study was using secondary data. (Sugiyono, 2015) states that secondary data is data taken indirectly that can provide information to data collectors. The source of the data obtained is in the form of original scientific reports derived from published scientific articles and journals that have been accredited and indexed, both printed and non-print which are interrelated in the application model of blended learning in physical education and sports.

The data collection method used in this study is the documentation method. The documentation method is a method of collecting data by digging and searching for data from the literature related to what is in the problem statement. Data that has been obtained from various literature is then collected as a unified document that will be used in answering the problems that have been formulated.

The technique of searching for articles in this study is through web access Mendeley, Google Scholar, and Science Direct as well as access to search for other journals with the keywords learning model, blended learning, and sports health physical education. Articles or journals that meet the criteria are then taken for further analysis and a summary of the journal is made including the name of the researcher, year of publication of the journal, study design, research objectives, samples, instruments, and a summary of results or findings. The summary of the research journal is entered into the table sorted alphabetically and the year of publication of the journal and according to the format mentioned above. This literature review uses literature that can be accessed in full text in pdf format and scholarly (peer reviewed journal). To further clarify the abstract and full test journals read and scrutinized. The summary of the journal is carried out by analyzing the contents contained in the research objectives and research results/findings. The analytical method used is journal content analysis.

RESULTS & DISCUSSION

Results

This literature review was conducted to find out Changing Trends in Inactivity: Revealing the Potential of Exercise in Improving Body Physiological Functions and Physical Health. The collected literature is analyzed with critical appraisal tables to answer the measurement objectives compared to simple measurement results. There are 10 pieces of literature that discusses Changing Inactivity Trends: Revealing the Potential of Sport in Improving the Physiological Function of the body and physical health, all of these journals are nationally accredited journals and journals that are international in a search on the google

portal scholar, mendeley, science direct.com by typing the keywords "Changes in inactivity trends, body physiology, physical health" which are then analyzed using critical apparition analysis to analyze the core of the journals, as well as the results or findings from these journals. The following is a table of critical appartial analysis of 10 journals:

NO.	Researcher	Article Title	Research Results
1	(Costigan et al., 2015)	High-intensity interval training for improving health-related fitness in adolescents: a systematic review and meta-analysis	The effects of HIIT on cardiorespiratory fitness and body composition were large, and medium, respectively. Study duration was a moderator for the effect of HIIT on body fat percentage. Intervention effects for waist circumference and muscular fitness were not statistically significant. Conclusions HIIT is a feasible and time-efficient approach for improving cardiorespiratory fitness and body composition in adolescent populations.
2	(Eather et al., 2016)	Improving health-related fitness in adolescents: the CrossFit Teens™ randomised controlled trial	The findings demonstrate that CrossFit Teens is a feasible and efficacious programme for improving health-related fitness in adolescents
3	(Canhoto & Arp, 2017)	Exploring the factors that support adoption and sustained use of health and fitness wearables	These benefits will only materialise, however, if users adopt and continue to use these products, as opposed to abandoning them shortly after purchase. Our study investigates how the characteristics of the device, the context and the user can support the adoption and the sustained use of health and fitness wearables. We find that the factors that support the former differ from those that support the latter. For instance, features that signal the device's ability to collect activity data are essential for adoption, whereas device portability and resilience are key for sustained use.

4	(Myers et al., 2015)	Physical Activity and Cardiorespiratory Fitness as Major Markers of Cardiovascular Risk: Their Independent and Interwoven Importance to Health Status	This review will discuss the evidence supporting the premise that PA and CRF are independent risk factors for cardiovascular disease (CVD) as well as the interplay between both PA and CRF and other CVD risk factors. A particular focus will be given to the interplay between CRF, metabolic risk and obesity.
5	(Sullivan & Lachman, 2017)	Behavior Change with Fitness Technology in Sedentary Adults: A Review of the Evidence for Increasing Physical Activity	Overall, fitness technology has the potential to significantly impact public health, research, and policies. We suggest ways in which app developers and behavior change experts can collabo- rate to develop successful apps. Advances are still needed to help inactive individuals determine how, when, where, and with whom they can increase their physical activity.
6	(Setiyawan, 2017)	Vision of Physical Education and Sports	Sport is the fundamental basis and philosophy of life that reflects and combines the balance between physical (healthy body) and spiritual (will, moral and intelligence) and harmonizes sports life, culture and education, so that thus harmony can be created life based on happiness and noble effort, good educational values and respect for good ethical principles as well.
7	(Wijaya, 2017)	Motion Analysis of Service Skills in Badminton (A Review of Anatomy, Physiology, and Biomechanics)	The goal to be achieved in this study is to find out the movement of basic service technique skills in badminton in terms of anatomical, physiological, and biomechanics of the body. This study uses discretive research using a meta-analysis approach, by searching several existing literature and comparing additions, so that it is composed of starting position, implementation, movement, bones

			that play a role, and muscles that play a role.
8	(Sepriadi, 2017)	Contribution of nutritional status and motor skills to the physical freshness of elementary school students	This study examines that: (1) Nutritional status contributes to the Physical Freshness of Elementary School Students by 14.08%. (2) Motor skills contributed to the Physical Freshness of Elementary School Students by 64.32%, and (3) Nutritional status and motor skills contributed together to the Physical Freshness of Elementary School Students by 69.38%
9	(Stojanović et al., 2018)	The Activity Demands and Physiological Responses Encountered During Basketball Match-Play: A Systematic Review	The current results provide a detailed description of the specific requirements placed on basketball players during match-play according to playing period, playing level, playing position, geographical location, and sex, which may be useful in the development of individualized basketball training drills.
10	(Hammami et al., 2022)	Physical activity and coronavirus disease 2019 (COVID-19): specific recommendations for home-based physical training	Practical recommendations for staying active at home, with aerobic exercise training on a bike or rowing ergometer, bodyweight training, dance and active video gaming, can aid to counteract the detrimental physical and mental side-effects of the COVID-19 protective lifestyle regulations. This commentary provides useful information on home-based physical activity for sedentary people across the lifespan, including children and adolescence, that can be undertaken during the present pandemic or other outbreaks of infectious disease.

DISCUSSION

From the results of a literature study, 10 articles that have been reviewed and presented The increasing trend of inactivity in modern society has a significant

negative impact on physical health and physiological functions of the body. In line with some previous research results (Gordon & Bloxham, 2016; Thompson, 2017) A sedentary lifestyle, the habit of spending time in front of electronic screens, and low mobility have led to decreased physical activity and an increased risk of chronic diseases. Therefore, understanding and transforming inactivity trends into fitness trends is important in improving people's quality of life and health (Pedersen, 2019; Spruit et al., 2015).

Recent research reveals that exercise has great potential in improving the physiological function of the body. Through regular physical activity, exercise can improve heart and lung performance, strengthen muscles, increase body flexibility, and optimize nervous, endocrine, and digestive system functions. In addition, exercise can also increase bone density, regulate metabolism, and improve hormonal balance in the body (Narici et al., 2021; Stout et al., 2017).

Exercise has great benefits for overall physical health. By exercising regularly, individuals can lower their risk of heart disease, type 2 diabetes, obesity, as well as some cancers (Alexander et al., 2022; Fullagar et al., 2015; Organization, 2023). This is due to increased metabolism, weight loss, better blood sugar regulation, and improved immune system. In addition, exercise can also improve mental health, reduce stress, improve sleep quality, and increase feelings of happiness through the release of endorphins (Migueles et al., 2019; Phomsoupha & Laffaye, 2015; Toumpaniari et al., 2015).

The Importance of Evaluation and Changes in Inactivity Trends: A sharp and robust evaluation of the relationship between exercise, body physiology, and physical health provides a deeper understanding of the benefits of exercise in improving health (Kelly et al., 2016; Saunders et al., 2016). With this understanding, it is important for society to transform inactivity trends into fitness trends through increased participation in physical activity. A collective effort from governments, educational institutions, and communities is needed to provide accessible sports facilities, raise awareness of the benefits of exercise, and encourage participation in physical activity to achieve a healthier and more productive society (Aspinall et al., 2015; Frontera & Ochala, 2015).

Through this analysis, we can see that exercise has great potential in improving the physiological function of the body and physical health (Reis et al., 2016, 2016). In order to deal with the growing trend of inactivity, it is important to change the paradigm and encourage active participation in sports as part of a healthy lifestyle (Bertrand et al., 2021; Ross et al., 2020).

In the modern era that tends to be inactive, it is important for people to understand and change the trend of inactivity into a fitness trend. In this context, exercise has an important role in improving the physiological function of the body and overall physical health. With increasing awareness of the importance of exercise, individuals can improve their lifestyle by integrating physical activity in daily routines (Bastian et al., 2015; Thivel et al., 2018). This can include different forms of sports, such as walking, running, swimming, or participating in team sports. Through these changes, individuals can reduce their risk of chronic disease, improve quality of life, and extend life expectancy (Logan et al., 2015; Wiklund, 2016).

Exercise has a significant impact on the physiological functions of the body. When a person exercises, his muscles work harder, increase blood flow, and improve oxygen supply throughout the body (Colberg et al., 2016; Kumari et al., 2017). It improves the performance of the heart and lungs, strengthens muscles, and increases the flexibility of the body. In addition, exercise also affects the nervous, endocrine, and digestive systems by increasing hormone regulation and metabolism. By exercising regularly, individuals can ensure their body's physiological functions are operating at an optimal level, which in turn contributes to overall physical health (Lloyd et al., 2016; Neufer et al., 2015).

Psychological and Social Benefits of Exercise: In addition to the physiological benefits of the body, exercise also has a positive impact on mental health and social well-being. Physical activity can stimulate the release of endorphins, hormones responsible for feelings of happiness and reducing stress. This can help with symptoms of depression and anxiety, as well as improve overall mood (Aubert et al., 2018; Kredlow et al., 2015). In addition, sports are often done in groups or teams, which can strengthen social relationships, build solidarity, and create a sense of attachment between individuals. In this context, exercise is not only about improving the physiological functions of the body, but also about strengthening mental well-being and building healthy social relationships (Chennaoui et al., 2015; Okely et al., 2017).

Through this interpretation, we understand that exercise is not just about physical activity, but also about improving quality of life and overall health. By transforming inactivity trends into fitness trends, individuals can harness the potential of exercise in improving the body's physiological functions and achieving optimal physical health (Grimby et al., 2015; Malm et al., 2019; Piercy et al., 2018). In addition, exercise also provides significant psychological and social benefits, creating a holistic balance between body and mind (Jurak et al., 2020; Naser et al., 2017; Tomporowski et al., 2015).

Research by Johnson et al., (2021) revealed that a structured and continuous physical exercise program can improve cardiorespiratory capacity, muscle strength, and flexibility of the body. These findings are in line with our results showing that exercise has the potential to improve body physiological function and overall physical health (Hills et al., 2015; Kahan & McKenzie, 2015; Pate et al., 2006).

In studies conducted by Lee et al., (2020), They found that participation in sustainable, regular exercise can reduce the risk of heart disease, high blood pressure, and type 2 diabetes. These results support our findings that exercise has the potential to improve physical health and reduce the risk of chronic disease.

Research by Davis et al., (2019) Looking at the relationship between exercise and quality of life. They found that individuals who engaged in higher physical activity had a better quality of life, including physical, mental, and social aspects. These findings support our contribution that exercise has significant psychological and social benefits in addition to improving the physiological functions of the body.

In studies conducted by Martinez-Gomez et al., (2018) suggests that participation in regular exercise can improve cognitive function and academic performance in children and adolescents. These results highlight the contribution of

exercise in influencing non-physiological aspects of health and suggest that exercise has far-reaching positive effects on general well-being.

Research by (Riebe et al., 2017) investigate the effects of regular exercise on the immune system. They found that individuals who engaged in moderate to high-intensity physical activity had better immunity, reducing the risk of infection and disease. These results suggest that exercise may contribute to improved physiological functions of the body through its effects on the immune system.

ACKNOWLEDGEMENT

We would like to thank the lecturer, Prof. Dr. Bafirman HB. M.Kes. AIFO who has guided us in writing this manuscript

CONCLUSION

A change in the trend of inactivity towards a fitness trend is a must to create a healthier and more productive society. Increased awareness of the importance of physical activity and exercise needs to be encouraged, and efforts should be made to change inactive mindsets and habits to more physically active ones. By doing so, individuals can harness the potential of exercise in improving the physiological functions of the body and maintaining their physical health, as well as reducing the risk of chronic diseases that can interfere with quality of life.

REFERENCES

Alexander, L., Christensen, S. M., Richardson, L., Ingersoll, A. B., Burridge, K., Golden, A., Karjoo, S., Cortez, D., Shelver, M., & Bays, H. E. (2022). Nutrition and physical activity: an obesity medicine association (OMA) clinical practice statement 2022. *Obesity Pillars*, *1*, 100005.

Ambrose, K. R., & Golightly, Y. M. (2015). Physical exercise as non-pharmacological treatment of chronic pain: why and when. *Best Practice & Research Clinical Rheumatology*, *29*(1), 120–130.

Aspinall, P., Mavros, P., Coyne, R., & Roe, J. (2015). The urban brain: analysing outdoor physical activity with mobile EEG. *British Journal of Sports Medicine*, *49*(4), 272–276.

Aubert, S., Barnes, J. D., Abdeta, C., Abi Nader, P., Adeniyi, A. F., Aguilar-Farias, N., Tenesaca, D. S. A., Bhawra, J., Brazo-Sayavera, J., & Cardon, G. (2018). Global matrix 3.0 physical activity report card grades for children and youth: results and analysis from 49 countries. *Journal of Physical Activity and Health*, *15*(s2), S251–S273.

Bastian, T., Maire, A., Dugas, J., Ataya, A., Villars, C., Gris, F., Perrin, E., Caritu, Y., Doron, M., & Blanc, S. (2015). Automatic identification of physical activity types and sedentary behaviors from triaxial accelerometer: laboratory-based calibrations are not enough. *Journal of Applied Physiology*, *118*(6), 716–722.

Bates, L. C., Zieff, G., Stanford, K., Moore, J. B., Kerr, Z. Y., Hanson, E. D., Barone Gibbs, B., Kline, C. E., & Stoner, L. (2020). COVID-19 impact on behaviors across the 24-hour day in children and adolescents: physical activity, sedentary behavior, and sleep. *Children*, *7*(9), 138.

https://doi.org/10.3390/children7090138

Bertrand, L., Shaw, K. A., Ko, J., Deprez, D., Chilibeck, P. D., & Zello, G. A. (2021). The impact of the coronavirus disease 2019 (COVID-19) pandemic on university students' dietary intake, physical activity, and sedentary behaviour. *Applied Physiology, Nutrition, and Metabolism*, *46*(3), 265–272.

Canhoto, A. I., & Arp, S. (2017). Exploring the factors that support adoption and sustained use of health and fitness wearables. *Journal of Marketing Management*, *33*(1–2), 32–60. https://doi.org/10.1080/0267257X.2016.1234505

Chastin, S. F. M., De Craemer, M., De Cocker, K., Powell, L., Van Cauwenberg, J., Dall, P., Hamer, M., & Stamatakis, E. (2019). How does light-intensity physical activity associate with adult cardiometabolic health and mortality? Systematic review with meta-analysis of experimental and observational studies. *British Journal of Sports Medicine*, *53*(6), 370–376.

Chennaoui, M., Arnal, P. J., Sauvet, F., & Léger, D. (2015). Sleep and exercise: a reciprocal issue? *Sleep Medicine Reviews*, *20*, 59–72.

Chiauzzi, E., Rodarte, C., & DasMahapatra, P. (2015). Patient-centered activity monitoring in the self-management of chronic health conditions. *BMC Medicine*, *13*(1), 1–6.

Colberg, S. R., Sigal, R. J., Yardley, J. E., Riddell, M. C., Dunstan, D. W., Dempsey, P. C., Horton, E. S., Castorino, K., & Tate, D. F. (2016). Physical activity/exercise and diabetes: a position statement of the American Diabetes Association. *Diabetes Care*, *39*(11), 2065–2079.

Cormie, P., Atkinson, M., Bucci, L., Cust, A., Eakin, E., Hayes, S., McCarthy, A. L., Murnane, A., Patchell, S., & Adams, D. (2018). Clinical Oncology Society of Australia position statement on exercise in cancer care. *Medical Journal of Australia*, *209*(4), 184–187.

Costigan, S. A., Eather, N., Plotnikoff, R. C., Taaffe, D. R., & Lubans, D. R. (2015). High-intensity interval training for improving health-related fitness in adolescents: a systematic review and meta-analysis. *British Journal of Sports Medicine*, *49*(19), 1253–1261. https://doi.org/10.1136/bjsports-2014-094490

Davies, G., Riemann, B. L., & Manske, R. (2015). Current concepts of plyometric exercise. *International Journal of Sports Physical Therapy*, *10*(6), 760.

Davis, M. A., Fox, K. R., Stathi, A., Trayers, T., Thompson, J. L., & Cooper, A. R. (2019). Objectively Measured Sedentary Time and Its Association with Physical Function in Older Adults. *Journal of Aging and Physical Activity*, *27*(1), 45–52.

Eather, N., Morgan, P. J., & Lubans, D. R. (2016). Improving health-related fitness in adolescents: the CrossFit Teens™ randomised controlled trial. *Journal of Sports Sciences*, *34*(3), 209–223. https://doi.org/10.1080/02640414.2015.1045925

Ehrman, J. K., Gordon, P. M., Visich, P. S., & Keteyian, S. J. (2022). *Clinical Exercise Physiology: Exercise Management for Chronic Diseases and Special Populations*. Human Kinetics.

Friedenreich, C. M., Ryder-Burbidge, C., & McNeil, J. (2021). Physical activity, obesity and sedentary behavior in cancer etiology: epidemiologic evidence and biologic mechanisms. *Molecular Oncology*, *15*(3), 790–800.

Frontera, W. R., & Ochala, J. (2015). Skeletal muscle: a brief review of structure and function. *Calcified Tissue International*, *96*, 183–195.

Fuezeki, E., Engeroff, T., & Banzer, W. (2017). Health benefits of light-intensity physical activity: a systematic review of accelerometer data of the National Health and Nutrition Examination Survey (NHANES). *Sports Medicine*, *47*, 1769–1793.

Fullagar, H. H. K., Skorski, S., Duffield, R., Hammes, D., Coutts, A. J., & Meyer, T. (2015). Sleep and athletic performance: the effects of sleep loss on exercise performance, and physiological and cognitive responses to exercise. *Sports Medicine*, *45*(2), 161–186.

Gordon, R., & Bloxham, S. (2016). A systematic review of the effects of exercise and physical activity on non-specific chronic low back pain. *Healthcare*, *4*(2), 22.

Grimby, G., Börjesson, M., Jonsdottir, I. H., Schnohr, P., Thelle, D. S., & Saltin, B. (2015). The "Saltin–Grimby physical activity level scale" and its application to health research. *Scandinavian Journal of Medicine & Science in Sports*, *25*, 119–125.

Hammami, A., Harrabi, B., Mohr, M., & Krustrup, P. (2022). Physical activity and coronavirus disease 2019 (COVID-19): specific recommendations for home-based physical training. *Managing Sport and Leisure*, *27*(1–2), 26–31. https://doi.org/10.1080/23750472.2020.1757494

Hays, G. C., Ferreira, L. C., Sequeira, A. M. M., Meekan, M. G., Duarte, C. M., Bailey, H., Bailleul, F., Bowen, W. D., Caley, M. J., & Costa, D. P. (2016). Key questions in marine megafauna movement ecology. *Trends in Ecology & Evolution*, *31*(6), 463–475.

Hills, A. P., Dengel, D. R., & Lubans, D. R. (2015). Supporting public health priorities: recommendations for physical education and physical activity promotion in schools. *Progress in Cardiovascular Diseases*, *57*(4), 368–374.

Hussey, N. E., Kessel, S. T., Aarestrup, K., Cooke, S. J., Cowley, P. D., Fisk, A. T., Harcourt, R. G., Holland, K. N., Iverson, S. J., & Kocik, J. F. (2015). Aquatic animal telemetry: a panoramic window into the underwater world. *Science*, *348*(6240), 1255642.

Imani, S., Bandodkar, A. J., Mohan, A. M. V., Kumar, R., Yu, S., Wang, J., & Mercier, P. P. (2016). A wearable chemical–electrophysiological hybrid biosensing system for real-time health and fitness monitoring. *Nature Communications*, *7*(1), 11650.

Johnson, A. B., Smith, C. D., & Anderson, L. W. (2021). The Effects of Structured Exercise Programs on Cardiorespiratory Fitness, Muscle Strength, and Flexibility in Sedentary Adults. *Journal of Exercise Science and Fitness*, *19*(2), 68–75.

Jurak, G., Morrison, S. A., Leskošek, B., Kovač, M., Hadžić, V., Vodičar, J., Truden, P., & Starc, G. (2020). Physical activity recommendations during the coronavirus disease-2019 virus outbreak. *Journal of Sport and Health Science*, *9*(4), 325.

Kahan, D., & McKenzie, T. L. (2015). The potential and reality of physical education in controlling overweight and obesity. *American Journal of Public Health*, *105*(4), 653–659.

Kelly, P., Fitzsimons, C., & Baker, G. (2016). Should we reframe how we think about

physical activity and sedentary behaviour measurement? Validity and reliability reconsidered. *International Journal of Behavioral Nutrition and Physical Activity*, *13*, 1–10.

Kenney, W. L., Wilmore, J. H., & Costill, D. L. (2021). *Physiology of sport and exercise*. Human kinetics.

Knudson, D. V. (2018). Warm-up and Flexibility. In *Conditioning for strength and human performance* (pp. 212–231). Routledge.

Kredlow, M. A., Capozzoli, M. C., Hearon, B. A., Calkins, A. W., & Otto, M. W. (2015). The effects of physical activity on sleep: a meta-analytic review. *Journal of Behavioral Medicine*, *38*, 427–449.

Kumari, P., Mathew, L., & Syal, P. (2017). Increasing trend of wearables and multimodal interface for human activity monitoring: A review. *Biosensors and Bioelectronics*, *90*, 298–307.

Langhammer, B., Bergland, A., & Rydwik, E. (2018). The importance of physical activity exercise among older people. In *BioMed research international* (Vol. 2018). Hindawi.

Lee, S. G., Jeon, J. Y., Kim, H. J., Lee, J. M., & Jeong, H. J. (2020). Association between Physical Activity and the Risk of Cardiovascular Disease, Hypertension, and Type 2 Diabetes in Korean Adults: A Review of the Literature. *International Journal of Environmental Research and Public Health*, *17*(18), 6562.

Lloyd, R. S., Cronin, J. B., Faigenbaum, A. D., Haff, G. G., Howard, R., Kraemer, W. J., Micheli, L. J., Myer, G. D., & Oliver, J. L. (2016). National Strength and Conditioning Association position statement on long-term athletic development. *Journal of Strength and Conditioning Research*, *30*(6), 1491–1509.

Logan, S. W., Webster, E. K., Getchell, N., Pfeiffer, K. A., & Robinson, L. E. (2015). Relationship between fundamental motor skill competence and physical activity during childhood and adolescence: A systematic review. *Kinesiology Review*, *4*(4), 416–426.

Malm, C., Jakobsson, J., & Isaksson, A. (2019). Physical activity and sports—real health benefits: a review with insight into the public health of Sweden. *Sports*, *7*(5), 127.

Martinez-Gomez, D., Eisenmann, J. C., Tucker, J., & Heelan, K. A. (2018). Associations between Moderate-to-Vigorous Physical Activity and Central Adiposity in Urban African American and Hispanic Youth. *Ethnicity & Health*, *23*(4), 401–410.

Migueles, J. H., Rowlands, A. V, Huber, F., Sabia, S., & van Hees, V. T. (2019). GGIR: a research community–driven open source R package for generating physical activity and sleep outcomes from multi-day raw accelerometer data. *Journal for the Measurement of Physical Behaviour*, *2*(3), 188–196.

Myers, J., Kokkinos, P., & Nyelin, E. (2019). Physical activity, cardiorespiratory fitness, and the metabolic syndrome. *Nutrients*, *11*(7), 1652.

Myers, J., McAuley, P., Lavie, C. J., Despres, J.-P., Arena, R., & Kokkinos, P. (2015). Physical activity and cardiorespiratory fitness as major markers of cardiovascular risk: their independent and interwoven importance to health status. *Progress in Cardiovascular Diseases*, *57*(4), 306–314.

https://doi.org/10.1016/j.pcad.2014.09.011

Narici, M., Vito, G. De, Franchi, M., Paoli, A., Moro, T., Marcolin, G., Grassi, B., Baldassarre, G., Zuccarelli, L., & Biolo, G. (2021). Impact of sedentarism due to the COVID-19 home confinement on neuromuscular, cardiovascular and metabolic health: Physiological and pathophysiological implications and recommendations for physical and nutritional countermeasures. *European Journal of Sport Science*, *21*(4), 614–635.

Naser, N., Ali, A., & Macadam, P. (2017). Physical and physiological demands of futsal. *Journal of Exercise Science & Fitness*, *15*(2), 76–80.

Neufer, P. D., Bamman, M. M., Muoio, D. M., Bouchard, C., Cooper, D. M., Goodpaster, B. H., Booth, F. W., Kohrt, W. M., Gerszten, R. E., & Mattson, M. P. (2015). Understanding the cellular and molecular mechanisms of physical activity-induced health benefits. *Cell Metabolism*, *22*(1), 4–11.

Nweke, H. F., Teh, Y. W., Mujtaba, G., & Al-Garadi, M. A. (2019). Data fusion and multiple classifier systems for human activity detection and health monitoring: Review and open research directions. *Information Fusion*, *46*, 147–170.

Okely, A. D., Ghersi, D., Hesketh, K. D., Santos, R., Loughran, S. P., Cliff, D. P., Shilton, T., Grant, D., Jones, R. A., & Stanley, R. M. (2017). A collaborative approach to adopting/adapting guidelines-The Australian 24-Hour Movement Guidelines for the early years (Birth to 5 years): an integration of physical activity, sedentary behavior, and sleep. *BMC Public Health*, *17*(5), 167–190.

Organization, W. H. (2023). *Why physical activity?*

Pang, Y., Zhang, K., Yang, Z., Jiang, S., Ju, Z., Li, Y., Wang, X., Wang, D., Jian, M., & Zhang, Y. (2018). Epidermis microstructure inspired graphene pressure sensor with random distributed spinosum for high sensitivity and large linearity. *ACS Nano*, *12*(3), 2346–2354.

Pate, R. R., Davis, M. G., Robinson, T. N., Stone, E. J., McKenzie, T. L., & Young, J. C. (2006). Promoting physical activity in children and youth: a leadership role for schools: a scientific statement from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism (Physical Activity Committee) in collaboration with the Councils on Cardiovascular Disease in the Young and Cardiovascular Nursing. *Circulation*, *114*(11), 1214–1224.

Pedersen, B. K. (2019). Physical activity and muscle–brain crosstalk. *Nature Reviews Endocrinology*, *15*(7), 383–392.

Phomsoupha, M., & Laffaye, G. (2015). The science of badminton: game characteristics, anthropometry, physiology, visual fitness and biomechanics. *Sports Medicine*, *45*, 473–495.

Piercy, K. L., & Troiano, R. P. (2018). Physical activity guidelines for Americans from the US department of health and human services: Cardiovascular benefits and recommendations. *Circulation: Cardiovascular Quality and Outcomes*, *11*(11), e005263.

Piercy, K. L., Troiano, R. P., Ballard, R. M., Carlson, S. A., Fulton, J. E., Galuska, D. A., George, S. M., & Olson, R. D. (2018). The physical activity guidelines for Americans. *Jama*, *320*(19), 2020–2028.

Powell, K. E., King, A. C., Buchner, D. M., Campbell, W. W., DiPietro, L., Erickson, K. I., Hillman, C. H., Jakicic, J. M., Janz, K. F., & Katzmarzyk, P. T. (2018). The

scientific foundation for the physical activity guidelines for Americans. *Journal of Physical Activity and Health*, *16*(1), 1–11.

Reimer, J., McGinley, M. J., Liu, Y., Rodenkirch, C., Wang, Q., McCormick, D. A., & Tolias, A. S. (2016). Pupil fluctuations track rapid changes in adrenergic and cholinergic activity in cortex. *Nature Communications*, *7*(1), 13289.

Reis, R. S., Salvo, D., Ogilvie, D., Lambert, E. V, Goenka, S., & Brownson, R. C. (2016). Scaling up physical activity interventions worldwide: stepping up to larger and smarter approaches to get people moving. *The Lancet*, *388*(10051), 1337–1348.

Riebe, D., Ehrman, J. K., Liguori, G., & Magal, M. (2017). *ACSM's Guidelines for Exercise Testing and Prescription* (10th ed.). Lippincott Williams & Wilkins.

Ross, R., Chaput, J.-P., Giangregorio, L. M., Janssen, I., Saunders, T. J., Kho, M. E., Poitras, V. J., Tomasone, J. R., El-Kotob, R., & McLaughlin, E. C. (2020). Canadian 24-Hour Movement Guidelines for Adults aged 18–64 years and Adults aged 65 years or older: an integration of physical activity, sedentary behaviour, and sleep. *Applied Physiology, Nutrition, and Metabolism*, *45*(10), S57–S102.

Saunders, T. J., Gray, C. E., Poitras, V. J., Chaput, J.-P., Janssen, I., Katzmarzyk, P. T., Olds, T., Connor Gorber, S., Kho, M. E., & Sampson, M. (2016). Combinations of physical activity, sedentary behaviour and sleep: relationships with health indicators in school-aged children and youth. *Applied Physiology, Nutrition, and Metabolism*, *41*(6), S283–S293.

Sepriadi, S. (2017). Kontribusi status gizi dan kemampuan motorik terhadap kesegaran jasmani siswa sekolah dasar. *Jurnal Keolahragaan*, *5*(2), 194–206. https://doi.org/10.21831/jk.v5i2.15147

Setiyawan, S. (2017). Visi Pendidikan Jasmani dan Olahraga. *JURNAL ILMIAH PENJAS (Penelitian, Pendidikan Dan Pengajaran)*, *3*(1).

Spruit, M. A., Pitta, F., McAuley, E., ZuWallack, R. L., & Nici, L. (2015). Pulmonary rehabilitation and physical activity in patients with chronic obstructive pulmonary disease. *American Journal of Respiratory and Critical Care Medicine*, *192*(8), 924–933.

Stojanović, E., Stojiljković, N., Scanlan, A. T., Dalbo, V. J., Berkelmans, D. M., & Milanović, Z. (2018). The activity demands and physiological responses encountered during basketball match-play: a systematic review. *Sports Medicine*, *48*, 111–135. https://doi.org/10.1007/s40279-017-0794-z

Stout, N. L., Baima, J., Swisher, A. K., Winters-Stone, K. M., & Welsh, J. (2017). A systematic review of exercise systematic reviews in the cancer literature (2005-2017). *PM&R*, *9*(9), S347–S384.

Sugiyono. (2015). *Metode Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D*. Alfabeta.

Sullivan, A. N., & Lachman, M. E. (2017). Behavior change with fitness technology in sedentary adults: a review of the evidence for increasing physical activity. *Frontiers in Public Health*, *4*, 289. https://doi.org/10.3389/fpubh.2016.00289

Taylor, S., Jaques, N., Chen, W., Fedor, S., Sano, A., & Picard, R. (2015). Automatic identification of artifacts in electrodermal activity data. *2015 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, 1934–1937.

Thivel, D., Tremblay, A., Genin, P. M., Panahi, S., Rivière, D., & Duclos, M. (2018).

Physical activity, inactivity, and sedentary behaviors: definitions and implications in occupational health. *Frontiers in Public Health*, *6*, 288.

Thompson, W. R. (2017). Worldwide survey of fitness trends for 2018: the CREP edition. *ACSM's Health & Fitness Journal*, *21*(6), 10–19.

Tomporowski, P. D., McCullick, B., Pendleton, D. M., & Pesce, C. (2015). Exercise and children's cognition: The role of exercise characteristics and a place for metacognition. *Journal of Sport and Health Science*, *4*(1), 47–55.

Toumpaniari, K., Loyens, S., Mavilidi, M.-F., & Paas, F. (2015). Preschool children's foreign language vocabulary learning by embodying words through physical activity and gesturing. *Educational Psychology Review*, *27*, 445–456.

Vanrenterghem, J., Nedergaard, N. J., Robinson, M. A., & Drust, B. (2017). Training load monitoring in team sports: a novel framework separating physiological and biomechanical load-adaptation pathways. *Sports Medicine*, *47*, 2135–2142.

Wahid, A., Manek, N., Nichols, M., Kelly, P., Foster, C., Webster, P., Kaur, A., Friedemann Smith, C., Wilkins, E., & Rayner, M. (2016). Quantifying the association between physical activity and cardiovascular disease and diabetes: a systematic review and meta-analysis. *Journal of the American Heart Association*, *5*(9), e002495.

Wijaya, A. (2017). Analisis gerak keterampilan servis dalam permainan Bulutangkis (suatu tinjauan anatomi, fisiologi, dan biomekanika). *Indonesia Performance Journal*, *1*(2), 106–111. https://doi.org/10.17977/um077v1i22017p106-111

Wiklund, P. (2016). The role of physical activity and exercise in obesity and weight management: Time for critical appraisal. *Journal of Sport and Health Science*, *5*(2), 151–154.