SAVOIRS EN SCIENCES DU SPORT

Shared Open Access Publishing Platform

Thinking Physical Activity in a Climate Change Context: A Bidirectional Relationship

Dr. Paquito Bernard

Inserm (French National Institute of Health and Medical Research)

ABSTRACT

This article synthesises a lecture by Dr. Paquito Bernard on the bidirectional relationship between climate change and physical activities. The core thesis is that climate exposures (e.g., heatwaves, air pollution) are disproportionately reducing physical activity levels, while behaviours associated with physical activities (e.g., transport for sport) contribute to greenhouse gas emissions. The article reviews evidence on the impacts on active transport and athletic performance and underscores the social inequalities exacerbated by these effects. It advocates for promoting active travel, updating physical activity guidelines for climate realities, and revising high-emission transport practices in sports. It concludes with a call for physical education communities to engage in activism and advocacy to accelerate structural changes, such as cycling infrastructure, for a climate-resilient future.

INTRODUCTION

The escalating climate crisis, underscored by a series of stark warnings from the global scientific community, presents a profound and complex challenge to public health (Ripple et al., 2017,2020). While the impacts of climate change on public health is increasingly well-documented, its influence on physical activity behaviours remains a comparatively underexplored yet critical area of concern. Physical activities are a cornerstone of public health, with well-established benefits for preventing chronic diseases, improving well-being, and enhancing health related quality of life. However, the structural conditions that enable and encourage active lifestyles are being fundamentally altered by a changing climate consequence.

This article synthesises a lecture by Dr. Paquito Bernard which highligths the bidirectional associations between climate change and physical activities. The presentation's central thesis is twofold. First, it argues that climate-related hazards (i.e., rising temperatures, heatwaves, worsening air pollution, increasing frequency and intensity of natural disasters) are creating significant barriers to physical activities. All physical activity domains are impacted: leisure and sports activities, occupational and household activities and active transport. These impacts are not distributed equally, disproportionately affecting vulnerable populations (e.g., people living close to heat island in urban context) and exacerbating existing social and health inequalities.

Second, the lecture contends that the physical activities cannot be seen as a passive victim of climate change. Several behaviours associated with sport and physical activity (e.g., air/car travels for competitions and training, meat consumption) accelerate directly the greenhouse gas emissions. This creates a feedback loop where the pursuit of physical activities can inadvertently undermine the structural conditions necessary for its continuation. By examining this dual relationship, this article aims to provide a comprehensive overview of the challenges and opportunities at the intersection of climate change and physical activities. It will explore the evidence base for these impacts, analyse the associated inequalities, and outline a series of actionable recommendations for policy, practice, and research, calling for a fundamental rethinking of how we promote and engage in physical activity in the context of a climate emergency.

PRESENTATION HIGHLIGHTS

Dr. Bernard's presentation systematically unpacked the complex, two-way relationship between climate change and physical activities, grounding the discussion in recent scientific evidence and illustrating it with compelling case studies. The following sections synthesise the core arguments and data presented.

2.1. THE IMPACT OF CLIMATE CHANGE ON PHYSICAL ACTIVITY

The lecture established that climate change is no longer a future threat but a present-day reality that is actively reducing physical activity levels globally. Evidence from a systematic review revealed that climate-related hazards such as air pollution, heatwaves, and flood episodes have a substantial negative impact on leisure, active travel, and occupational physical activity (Bernard et al., 2021). For instance, rising air pollution or smog episodes are directly associated with decreased overall physical activity and a reduction in the use of urban cycling. Similarly, frequent flash floods in Asia, have been linked to significant declines in daily number of steps.

A key focus was the effect of rising global temperatures and heatwaves, which cause substantial reductions in physical activity. This was vividly illustrated through an analysis of shared bike systems in New York and San Francisco. The data revealed an inverted U-shaped relationship between daily bike use and outdoor temperature: usage increases with temperature up to a threshold of approximately ~32°C (around 90°F), beyond which it declines sharply as the heat becomes a significant deterrent (Pitois et al., 2025). are more early among vulnerable groups such as adults with obesity or older adults.

It is important to note that the negative impact of local identified temperature thresholds occur earlier for adults with chronic diseases, higher body mass index, and those over 60 years. Furthermore, extreme temperature can intensify social and geographical inequalities. For instance, in low-income neighbourhoods in the San Francisco Bay Area, residents did not show a decrease in active travel during heatwaves. It can be explained by a limited access to public transport or car, and it forced them to continue cycling for essential commuting despite the elevated health risks (Karner et al., 2015). The presentation also touched upon the impact of ozone and particulate matter concentrations on sports

performance, citing a systematic review that found strong evidence of negative effects on both elite and non-elite athletes. Modelling of football performance, for instance, showed a linear negative association between particulate matter concentrations and key metrics like the number of passes per match (Bernard et al., in press).

2.2. PHYSICAL ACTIVITY'S CONTRIBUTION TO GREENHOUSE GAS EMISSIONS

The lecture pivoted to the other side of the bidirectional relationship, arguing that the physical activity sector must also acknowledge its own contribution to greenhouse gas emissions. While physical activity itself is inherently low-carbon, the behaviours and systems surrounding it, particularly transport, diet, materials, can have a significant carbon footprint. The presentation highlighted the stark contrast between the Paris Agreement's benchmark of approximately ~2 tons of CO_2-equivalent (CO_{2e}) per person per year and the actual carbon footprints in many developed nations, which are often an order of magnitude higher.

Elite sport was presented as a particularly salient example. The annual travel-related carbon footprint of a single English Premier League football player was calculated to be approximately 30 tons of CO_2. This study only accounted for travel and housing to matches and excludes personal emissions, training camps, and other related activities (Pereira, 2019). This high level of emissions is driven by a culture of frequent air travel for (inter)national competitions, a practice that has become normalised across many professional sports.

The issue is not confined to the elite level. A German study of non-professional athletes found that sport-related emissions comprised between 8% to 25 % of their total individual carbon footprints. The study identified sports like golf, diving and surfing as having particularly high emissions, largely due to the travel required to access specific facilities or locations. The primary determinant of an athlete's carbon footprint their annual income. Higher income correlates strongly with higher sport-related emissions (e.g., more frequent air travel) (Castagneide, 2022). Beyond air travel, the presentation also identified high meat consumption, often promoted within sports culture to meet protein needs, as another behaviour with a significant impact on individual carbon footprints.

2.3. POSITIVE ROLES FOR PHYSICAL ACTIVITY AND POLICY RECOMMENDATIONS

Despite these challenges, the presentation emphasised that physical activities can be a central part of the solution to the climate crisis. The most powerful lever identified is the promotion of active travel. Scenario studies demonstrate that even modest mode shifts from private cars to cycling and walking can yield meaningful local reductions in air pollution and greenhouse gas emissions. This creates a powerful co-benefit scenario, where promoting active lifestyles simultaneously advances public health and climate mitigation goals.

The physical activity communities also have a vital role to play in building resilience to climate impacts. Studies from the US and the Philippines have shown the effectiveness of adapted physical education (PE) interventions in helping children exposed to natural disasters reduce their risk of post-

traumatic stress disorder at short term (Bell, 2019). This suggests an expanded mission for PE teachers and sports communities, positioning them as key actors in psychosocial recovery. Local sport clubs and communities can provide both concrete support (e.g., distributing water and medicine) and emotional support during and after climate-related disasters.

To harness this potential, the lecture concluded with a series of clear recommendations for structural change:

1 Update Physical Activity Guidelines: National guidelines must be revised to integrate current and future climate hazards. This includes providing advice on adapting activity during heatwaves and poor air quality, as well as explicitly highlighting the climate/health benefits of active travel.
2 Revise Transport Modes: A major rethinking of transport associated with sport is needed at all levels. This involves questioning the necessity of long-distance air travel for competitions, active leisure time or international events (e.g., Olympic games).
3 Engage in Activism and Cooperation: The question of climate change and physical activities is a "race against time". PE and public health communities are urged to engage in activism to advocate for and protect infrastructure that supports active travel, such as protected bicycle networks near schools.
4 Integrate Climate Change Issues into Physical Education: Climate change impacts and the role of physical activity in adaptation and mitigation must be systematically included in the curricula of PE, public health, and sports science courses. An international Delphi study identified these specific competencies.

2.4. QUESTIONS AND ANSWERS

How does meat consumption compare to transport in terms of carbon footprint?

The discussion acknowledged that both air travel and meat consumption are highly impactful behaviours. While the lecture focused more on transport-related emissions as they are directly linked to the logistics of physical activity, it was emphasised that dietary choices, particularly high meat consumption, represent a major component of an individual's overall carbon footprint. The response suggested that PE teachers and coaches have a role to play in educating athletes and students about dietary shifts, particularly in challenging the sports culture's often heavy emphasis on animal protein. The key takeaway was that both transport and diet are critical levers for reducing emissions.

Is there a risk that focusing on the carbon footprint of physical activity could discourage people from being active?

This question addresses a potential communications challenge. The response clarified that the goal is not to create a sense of guilt or to discourage activity, but to foster a more critical and conscious approach. The distinction was made between physical activity itself (which is beneficial) and the high-

emission behaviours often associated with it (which are problematic). The focus should be on promoting low-carbon physical activity, such as local active travel, community sports, and outdoor recreation that does not require long-distance travel. The message is not “be less active,” but “be active differently.”

Isn’t building extensive bicycle infrastructure prohibitively expensive?

This common argument against active travel investment was directly countered with economic evidence. Dr. Bernard cited a paper from Schwarz et al. (2024), which has developed methods to quantify the health and economic savings generated by cycling . They found that >1 euro of intangible costs were prevented for every kilometer cycled in France.

CONCLUSION:

The intersection of climate change and physical activities is a domain of growing urgency. As synthesised from Dr. Paquito Bernard's lecture, climate change is undermining physical activity opportunities, with disproportionate impacts on vulnerable populations, while the physical activity sector contributes to the crisis through emissions-intensive practices. This demands a paradigm shift from a passive stance to active engagement. The path forward requires a dual strategy of adaptation (e.g., updating guidelines, building resilient infrastructure) and mitigation (e.g., rethinking high-carbon transport in sports). Active travel emerges as a powerful 'win-win' strategy for public health and climate action. Physical activity professionals must embrace their roles as educators and advocates to accelerate the transition to a sustainable future by integrating climate considerations into practice and engaging in the political processes that support low-carbon, active lives.

REFERENCES

Bell, L. (2019). Sport and physical activity in post-disaster intervention. *Prehospital and Disaster Medicine*.

Bernard, P., Bougault, V., Deshayes, T., Caille, P., Hognon, L., Martinet, Q., Caudroit, J., Oyeyemi, A., Romain, A.-J., Benmarhnia, T., & Chevance, G. (in press). Air pollution and performances in outdoor sports: A systematic review and meta-analysis of short-term associations in amateur and elite athletes. Economics.

Bernard, P., Chevance, G., Kingsbury, C., … (2021). Climate change, physical activity and sport: A systematic review. Sports Medicine, 51, 1041–1059. https://doi.org/10.1007/s40279-021-01439-4

Castagneide, C. (2022). The carbon footprint of sport participation in Germany. Journal of Sport & Tourism.

Karner, A., Pereira, R. H. M., & Farber, S. (2015). Active travel, public transportation, and social equity. Journal of Transport & Health.

Pereira, R. H. M. (2019). The carbon footprint of a Premier League football club. Journal of Cleaner Production.

Pitois, L., Chevance, G., Green, J. A., Benmarhnia, T., Gadais, T., & Bernard, P. (2025). Understanding urban climate-resilient cyclists: A solution to reducing individual motorized transport. PLOS Climate, 4(4), e0000611. https://doi.org/10.1371/journal.pclm.0000611

Ripple, W. J., Wolf, C., Newsome, T. M., Galetti, M., Alamgir, M., Crist, E., Mahmoud, M. I., & Laurance, W. F. (2017). World Scientists' Warning to Humanity: A Second Notice. BioScience, 67(12), 1026–1028. https://doi.org/10.1093/biosci/bix125

Ripple, W. J., Wolf, C., Newsome, T. M., Barnard, P., & Moomaw, W. R. (2019). World Scientists' Warning of a Climate Emergency. BioScience. https://doi.org/10.1093/biosci/biz088

Schwarz, E., Leroutier, M., De Nazelle, A., Quirion, P., & Jean, K. (2023). The untapped health and climate potential of cycling in France: a national assessment from individual travel data. https://doi.org/10.1101/2023.04.04.23288155