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Climate change: the next game changer for sport and exercise psychology

Introduction

Climate scientists have warned about the climate emergency for more than 40 years now (Ripple, Newsome, Barnard, & Moomaw, 2019). The message is simple: if we fail to quickly limit our ecological footprint (quantified through carbon emissions or other indicators), irreversible changes and disruptions of ecosystems, economies and societies will occur (Ripple et al., 2019). In the health domain, there is now a consensus that climate change dramatically affects human health and jeopardises the health of future generations (Watts et al., 2021). Climate change is clearly an all-encompassing influence on health, thus justifying the title of this present discussion paper: "Climate change: the next game changer for sport and exercise psychology". In our opinion there should be no debate about the major and increasing influence that climate change will have on the field of sport of exercise psychology in the next years, like any other scientific disciplines, or even broader aspects of our lives. How the field will contribute to climate change adaptation (i.e., reactive responses) and mitigation (i.e., proactive responses), however, is subject to discussion. The present paper aims to be one of the starting points for this discussion.

In sport and physical activity (PA) sciences, a recent systematic review has examined the bidirectional associations between PA domains, sport practices and climate change issues (Bernard et al., 2021). Furthermore, researchers from sport-related disciplines have developed ambitious projects to address climate change: sport management researchers have investigated the climate vulnerability of sport organizations (Orr & Inoue, 2019) and developed interventions to improve sport events' sustainability (Dingle, 2016); exercise physiologists have examined the associations between heat stress and exercise (Wingo, 2015) or athletes' performances (Kakamu, Wada, Smith, Endo, & Fukushima, 2017); sport medicine doctors have presented the intensification of allergens and air pollutants' deleterious effects for athletes (Schneider & Mücke, 2021); sport philosophers have questioned a possible anthropocentric to ecocentric sport model in deep ecology perspective (Breivik, 2019); and social scientists and anthropologists have analyzed and denounced the greenwashing strategies of the sport industry (Miller, 2016) and added expressions of slow sport (e.g., Nordic walking, long-distance hiking) into the broader concept of the slow movement (Lebreton, Gibout, & Andrieu, 2020). It seems that psychology of PA and sport is lagging behind these disciplines. For instance, in his excellent text, Raab questioned presidents of academic associations related to psychology of sport and exercise about their respective vision of our discipline in 2050 (Raab, 2017). Although their responses were original and well-argued (e.g., integration of sport psychologists in international organizations such as World Health Organization), climate change was not part of their vision (Raab, 2017). Climate change was only indirectly mentioned in suggesting that the United Nations sustainable development goals should be adopted in the psychology of PA and sport.

This text argues that sport and exercise psychology, as a scientific discipline, needs to address anthropogenic climate change by helping athletes, sport students, psychologists, coaches, physical educators, youth, sport communities and stakeholders, and all populations concerned and impacted by our field, to understand and adopt climate change adaptation and mitigation behaviors to ultimately trigger social changes in their respective communities.

Lessons learned from our systematic review about physical activity, sport and climate change

One of the main messages of our systematic review, which includes more than 70 articles, is that PA, sport and climate change are associated in a bidirectional way, or in other words, are influencing each other (Bernard et al., 2021).

First, anthropogenic climate change consequences are becoming a barrier to sport and PA practices. Air pollution and pollution alerts in the media, for instance, are negatively associated with PA partic-

ipation including recreational and occupational PA and active transport (An, Zhang, Ji, & Guan, 2018). Empirical investigations found an inverted-U shaped association between outdoor temperatures and leisure time PA, occupational PA and active transport. In other words, heat waves triggered a rapid PA decrease in included studies. Although scenario-based studies anticipate a positive effect of warming temperatures on PA for some areas of the Northern Hemisphere and during colder months of the year (see e.g., Obradovich & Fowler, 2017), these potential "benefits" could be attenuated by a reduction of PA and sport practices during summer. Usually, vulnerable adults (elderly, adults with respiratory diseases or with high body mass index) are more negatively impacted by air pollution and extreme heat (Bernard et al., 2021). Future international competitions are also threatened by the situation. In 2080, only 8/21 cities that previously hosted the Olympic winter game could still be suitable to host this event due to hotter winters and decreased amount of snow in these locations (Scott, Steiger, Rutty, & Johnson, 2015).

Second, PA in some forms can help mitigate climate change, or conversely, exacerbate it. Active transport plays a non-negligible role in the reduction of CO_2 emissions in urban environments, but the magnitude of the effect observed varies in function of study design and geographical areas (Keall, Shaw, Chapman, & Howden-Chapman, 2018). Conversely, amateur and professional sport practices are associated with elevated carbon footprints compared to average values in the general population (Wicker, 2019). For instance, the estimated average annual carbon footprint of English Premier League football player is 29 tonnes CO_2 (Tóffano Pereira, Filimonau, & Ribeiro, 2019), representing almost 3 times the annual carbon footprint of British adults (and dramatically exceeding the global objective of 2 tonnes per person if we want to meet the Paris agreement). Natural hazards (hurricanes/cyclones, floods, droughts and typhoons) have a negative impact on PA and sedentary behaviors through direct (i.e., infrastructure damage) and indirect (i.e., posttraumatic stress disorder) pathways (Doubleday, Choe, Miles, & Errett, 2019). At the same time, PA organizations have shown great utility in post-natural disaster contexts by providing direct support to populations (cargo-bicycles) (Kirkpatrick, 2019) and promoting additional means to cope with states of post-disaster stress and anxiety (Akiyama, Gregorio, & Kobayashi, 2018). Finally, the concepts of "sustainable PA" or "slow sport" have been proposed in line with climate change challenges. Authors argued that sustainable PA should come with an important investment in active transport, developments in community PA practices and a reduction of equipment and appliances used in daily tasks (Bjørnarå, Torstveit, & Bere, 2019).

In conclusion, our review suggested that PA has two concurrent mitigation and amplification roles toward climate change. Thus, a portrait of associations between climate change and sport or PA has emerged, but very few studies have contributed to this literature from a psychological angle. The next sections give more details about the climate and health research landscape and then offer some perspectives specific to the field of sport and exercise psychology. Finally, some concrete examples of actions for the sport and exercise psychology community are presented.

Key points from climate sciences to bear in mind

Climate-change-related issues are multiple, complex, interrelated and better understood from a multidisciplinary perspective. The following key points are presented to summarize the most important facts about climate change for sport and exercise psychologists.

Climate change and health

The ecosystem impairments and environmental modifications associated with climate change are currently and will continue to disproportionately deteriorate population health at a worldwide scale (Watts et al., 2021). Climate change health effects are direct (i.e., floods, wildfires, heatwaves), ecosystem-mediated (e.g., increased infectious disease risk of malaria, reduced food yield) and indirect (e.g., climate migration, conflicts). They affect a large range of health domains such as health behaviors, health systems resilience, mortality risk, and stress-related disorders (Watts et al., 2021). It is estimated that between 1991 and 2018, human-induced climate change accounted for an increase of 37% in health-related mortality around the world (Vicedo-Cabrera et al., 2021). Also, people exposed to natural disasters had higher risk to develop mental disorders in the following months, and long-term environmental changes (e.g., desertification, coastal erosion) were associated with higher levels of eco-anxiety (Watts et al., 2021).

Climate change and equity

Climate change is challenging equity at a minimum of four levels: (i) within countries, (ii) between countries, (iii) at the intergenerational level and (iv) between genders (Chevance et al., 2022). First, within high-income countries, wealthy people produce more greenhouse gas emissions, while socially disadvantaged people have less resources to cope with present and future climate change consequences (Sorrell, Gatersleben, & Druckman, 2020). This phenomenon is accentuated in more unequal societies (Oswald, Owen, & Steinberger, 2020). Second, 50% of countries with the lowest incomes are responsible for only 15% of global greenhouse gases emissions, while the top 10% of high-income countries cause 33% of greenhouse gas emissions (Hubacek et al., 2017). After excluding oil producing countries (e.g., Kuwait, Qatar), the highest carbon footprints per capita are found in Australia, the Unites States, Canada (15–17 tonnes of CO_2 eq/capita and year) and Estonia, Taiwan, Russia, South Korea, Japan, Germany and the Netherlands (13–9 tonnes of CO_2 eq/capita and year) (Ritchie & Roser, 2017). People in low- and middle-income countries are likely to disproportionately suffer the health effects of climate change due not only to increased infectious diseases and climate

migration, but also health risks due to occupational physical activity in extreme weather (such as heat waves) or the disruption of lifestyle through long-term environmental change (Siefken, 2022). Third, there is a generational gap between increased greenhouse gas emissions and their major negative consequences (i.e., major effects of current emissions will be experienced 40–50 years later) (Ivanova et al., 2020). A *Lancet* report concluded that the health of a child born today will be threatened by our current greenhouse gas emissions (Watts et al., 2021). Fourth, climate change might have different impacts on women's health than that of men, and these effects might vary depending on the context (low- and middle-income countries versus high-income countries; van Daalen, Jung, Dhatt, & Phelan, 2020). In conclusion, understanding the impact of climate change on health and the impacts that individuals have on climate change requires accounting for various gender and socioeconomical aspects (Chevance et al., 2022).

Scaling the efforts needed

Worldwide greenhouse gas emissions should decrease around 5% per year to reach the Paris Agreement in 2050, i.e., to limit climate change to a 1.5 °C warming (IPCC, 2018). However, emissions are still rising worldwide, and the scale of the efforts needed to reach such an objective is considerable. For instance, the coronavirus disease 2019 (COVID-19) pandemic resulted in an estimated decrease of between 4 and 7% of the worldwide CO_2 emissions in 2020 compared to 2019 emissions (Le Quéré et al., 2020), and if we want to reach the Paris agreement, high-income countries' emissions must decrease by the same magnitude each year for the next several decades. This can only be reached by coupling political and large-scale regulation measures targeting energy-related emissions in industry, transport and food systems with individual lifestyle changes for residents in high-income countries (Schill et al., 2019). Not all pro-environmental behaviors have the same impact in terms of carbon footprints. In high-income countries, this means eating fewer animal products, reducing overeating and food waste, living car-free when possible, drastically decreasing (or stopping) flying frequency, having one fewer child and investing in building renovations (Ivanova et al., 2020). Sadly, national surveys suggest that people generally focus on low impact behaviors such as recycling, the purchase of organic food (which is presumed to have a lower ecological footprint) or efficient appliances (Bernard, 2019) while more drastic behavior change is needed.

Research questions for sport and exercise psychology

The *Encyclopedia of Sport and Exercise Psychology* covers 18 categories of broad topics related to human behavior in sport and PA settings (Eklund & Tenenbaum, 2014). Among them, several are relevant to coping with climate change issues, including knowledge about leadership, group dynamics, behavioral and social change, self-perception, psychological skills, motivational factors and mental health. For instance, these principles could be applied by researchers and experts in the discipline to promote the reorganization of national competitions among stakeholders, the adoption of pro-environmental behaviors in athletes and fans, and the development of interventions for eco-anxiety management in athletes. Although the distinction is sometimes challenging, climate change strategies tend to be classified as focusing on adaptation (i.e., reactive responses) and mitigation (i.e., proactive responses) (Bernard, 2019). ◘ **Table 1** proposes relevant research questions for both approaches for PA and sport psychology domains for the following psychological topics: risk perception, emotion, mental health, behavior change, group dynamics, and decision making.

When to start and how?

Even if we undertake these research activities on climate change topics, there are several years between dissemination of results and implementation of evidence-based strategies (Vealey, 1994). However, climate change is progressing quickly, and we have to act now. For instance, the number of climate refugees is growing and Sport for Development interventions could be developed for them to foster positive integration or reduced mental health issues associated with forced migration (Gadais, 2019). In this perspective, sport and exercise psychologists should systematically include climate change consequences for PA and sport in psychology courses to inform, engage, and motivate the next generation of researchers

Abstract

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Climate change: the next game changer for sport and exercise psychology

Abstract

According to Intergovernmental Panel on Climate Change experts, recent changes across the climate system are unprecedented, and the next decades are the most decisive in human history to drastically reduce global annual greenhouse gas emissions. This text argues that sport and exercise psychology, as a scientific discipline, needs to address anthropogenic climate change by helping athletes, sport students, psychologists, coaches, physical educators, youth, sport communities and stakeholders and all populations concerned by our field to adopt adaptation and mitigation behaviors and trigger social changes in their respective communities. We briefly present the bidirectional associations between physical activity, sport and climate change. Then, we highlight three key points about climate change: its effects on health, equity issues and behaviors change in line with currently needed climate efforts. Furthermore, we suggest a series of research questions for physical activity and sport psychology domains. Finally, we conclude by presenting a call to action.

Keywords

Global warming · Anthropocene · Biking · Sustainability · Performance · Lifestyle

Table 1 Proposed research questions for physical activity and sport psychologists in climate change perspectives

	Physical activity		Sport	
	Adaptation	**Mitigation**	**Adaptation**	**Mitigation**
Stress management/ risk perception	How can risk perception of climate change can help people shift toward more sustainable practices?	How can the disruptive effects of extreme weather events on PA practices motivate peoples to adopt more pro-environmental behaviors?	What are the coping strategies used during a heat wave in elite athletes?	What is the risk perception of global warming in snow sport federations? How could it be related to a future reorganization of international competitions?
Emotion	What is the effect of outdoor PA (e.g., hiking) on psychological distress in participants with high levels of eco-anxiety?	How do emotional responses to climate change information trigger more active travel in active adults?	What is the affective response to extreme pollution during a competition in elite runners?	What is the role of the emotional consequences of extreme weather events on athletes' perception of climate change and travel-related behaviors?
Mental health	How can we use PA interventions post-natural disaster to decrease acute stress symptoms in exposed communities and first responders (e.g., firefighters)?	What are the effects of replacing short car trips with active travel on psychological well-being?	What are the effects of a possible disappearance of outdoor ice or snow activities on psychological well-being?	How can we prepare athletes to manage the psychological consequences of a competition cancellation?
Implicit processes	–	How can we develop a habit of car sharing or public transport in amateur athletes?	How do implicit pro-environmental attitudes among sport stakeholders explain the sustainability of their sport events?	Can an "anti-charity" incentive intervention targeting football fans (e.g., failure to reach a personal objective will automatically give 0.10$ to Real Madrid for an Athletico Madrid fan) be effective to decrease car use frequency in an urban context?
Motivation	How do perceived air pollution episodes affect the psychological determinants of PA, and how can motivational approaches contribute to cope with pollution alerts?	How are PA beliefs and attitudes associated with climate change risk perceptions?	–	What are the psychological barriers to the switch from animal to vegetable protein sources in athletes targeting a muscle mass increase?
Behavior change	How can we increase PA self-efficacy during repeated heat waves and foster resilience?	Can repeated use of carbon footprint calculators and individualized feedback decrease greenhouse gas emissions associated with leisure PA? What are the most effective behavior change techniques to help car drivers shift to active transport? How should they be implemented?	What is the effect of SMT just in time intervention on training at home in university athletes during a pollution alert?	What are the most effective theory-based interventions to help sport industry stakeholders to organize future competitions with the lowest ecological and carbon footprint? How can the sport industry, supporters and fans implement effective psychological interventions in their respective communities to drastically reduce greenhouse gas emissions?
Group dynamics	In vulnerable communities where climate change disrupts occupational PA, how can we promote maintenance of adequate PA levels among workers?	How can we improve the collective self-efficacy of PA communities to be prepared for natural disasters in high-risk areas?	Can we use the sport group identity to increase pro-environmental behaviors in young athletes?	What are sport fans' attitudes to professional athletes' vegetarian diet promotion in social media?
Decision making	–	–	What are the risk perceptions of future international competitions among stakeholders and elite athletes?	How can we implement evidence-based strategies identified in Sport for Development after a natural disaster?

PA Physical activity, *SMT* short message text

and practicians in PA and sport science. A freely available set of multilingual infographics has been developed by our teams (https://osf.io/ej4mv/) for pedagogical purpose. Furthermore, the Sport Ecology Group has published a teaching guide about "Ten Things You Should Know About Sport & Climate" and several guides are available in the health domain (Sport Ecology Group, 2019). To achieve rapid outcomes, we urge all academics teaching sport and exercise psychology to integrate climate change into their educational programs. We also urge all researchers in sport and exercise psychology to progressively dedicate some of their time to the issue. This can be simple at beginning, for example by shifting from a tradition global level of PA as a dependent variable in their project to the measurement of active transportation, which is more relevant in a climate change context. Given the role of active transport as both a mitigation strategy for climate change and an effective means to increase PA levels, evidence-based strategies to increase PA should be implemented to promote active transport as a priority, rather than focusing on other forms of PA (Gourlan et al., 2016). This PA domain is an effective mitigation strategy but also promotes a reduction of inequalities between countries. For instance, the World Bicycle Relief program (World Bicycle Relief, 2018) report indicated that an increase of daily frequency of bicycle travels facilitated water accessibility, decreased car use in urban/rural contexts, and promoted community resilience post-natural disaster in sub-Saharan African countries. The topic of active transportation has mainly moved forward in fields such as environmental epidemiology (Nieuwenhuijsen, 2021) and a greater contribution of our community to this topic is crucial.

Sport organizations are also a good vector to communicate about climate change. For instance, *Football Ecologie France* has developed a "peer to peer" collaborative game called "The Climate Collage of football" for football clubs (www.football-ecology.org). This 2 h workshop is based on Climate Collage available in 25 languages (https://climatefresk.org/). It allows users to identify the environmental consequences of football, links with climate change, and concrete mitigation strategies. Exercise and sport psychologists could increasingly contribute to the evaluation and refinement of these types of programs, bringing their expertise in psychology and behavioral sciences.

In conclusion, the community of sport and exercise psychology should quickly act to cope with dramatic climate change issues. The principal risk for our community is to act too little and too late. An increasing number of opportunities in universities, think-tanks, (non)governmental organization and citizen initiatives offer us opportunities to transform PA and sport practices into eco-friendly and zero carbon human activities, and to use these platforms to mitigate the negative effects of climate change. We hope that this article will help to motivate sport and exercise psychologists to critically think about climate change in their daily lives and activities, as well as in their teaching, practice and research.

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Declarations

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