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How Societal Forces of Change Are Transforming Youth Physical Activity Promotion in North America

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Abstract

Background: Climate change, increasing recognition of institutionalized discrimination, and the COVID-19 pandemic are large-scale, societal events (ie, forces of change) that affect the timing, settings, and modes of youth physical activity. Despite the impact that forces of change have on youth physical activity and physical activity environments, few studies consider how they affect physical activity promotion.

Methods: The authors use 2 established frameworks, the ecological model of physical activity and the youth physical activity timing, how, and setting framework, to highlight changes in physical activity patterns of youth in North America that have resulted from contemporary forces of change.

Results: North American countries—Canada, Mexico, and the United States—have faced similar but contextually different challenges for promoting physical activity in response to climate change, increasing recognition of institutionalized discrimination, and the COVID-19 pandemic. Innovative applications of implementation science, digital health technologies, and community-

based participatory research methodologies may be practical for increasing and sustaining youth physical activity in response to these forces of change.

Conclusions: Thoughtful synthesis of existing physical activity frameworks can help to guide the design and evaluation of new and existing physical activity initiatives. Researchers, practitioners, and policymakers are encouraged to carefully consider the intended and unintended consequences of actions designed to respond to forces of change.

Keywords

social determinants of health; exercise; health inequities; children; adolescents

Physical activity during childhood and adolescence is important for the development of optimal health and a reduction in the risk of chronic disease outcomes (eg, diabetes and cancer).^{1,2} The benefits of physical activity for youth (aged 6–18 y) also include improved attention and focus, better attendance and academic performance, greater self-confidence, and lower levels of anxiety and depression.³ The development of healthy physical activity patterns begins in early childhood and involves individual (eg, socioeconomic status and gender) and environmental conditions (eg, places that children live, work, and play) that have an impact on pattern development.^{4,5} Moreover, individual-level risk factors (eg, income, race, and educational attainment) that are associated with the degree of participation in physical activity are affected by contextually determined external factors (eg, underresourced neighborhoods).⁶

In this commentary, the environmental context is considered within 2 established frameworks—the ecological model of physical activity (EMPA) and youth physical activity timing, how, and setting (Y-PATHS) framework. Both posit that environmental factors at different levels of the ecologic milieu (eg, interpersonal relationships and policies) are primary drivers of youth physical activity.^{7–9} At the outermost level, EMPA includes forces of change: large-scale events, movements, or other influences on youth physical activity (eg, world wars and technology).⁸ Forces of change exert pressure on environments within the system to modify them and affect youth physical activity.⁸ For example, World War II was a force of change that created heightened awareness about lower fitness levels in US youth, as compared with European youth, which resulted in the implementation of the US Presidential Fitness Test, a policy change that restructured physical education in the United States.^{10,11} Although the forces of change described in this commentary affect individuals across the lifespan, youth may experience different or more pronounced effects from middle-aged or older adults as youth will have a longer exposure period to forces of change, and the forces of change may continue to increase in prominence or severity over their lifetime.

The purpose of this commentary is to highlight recent changes in youth physical activity that have resulted from 3 contemporary forces of change: climate change, increasing recognition of institutionalized discrimination, and the COVID-19 pandemic. We present recent research from 3 countries from the continent of North America (Canada, Mexico, and the United States) that focuses on promoting physical activity in the context of emerging forces of change and discuss innovative applications of implementation science, digital health technologies, and community-based participatory research (CBPR) methodologies

for increasing and sustaining physical activity. Finally, we provide recommendations for promoting youth physical activity.

Synthesized Conceptual Models

The EMPA posits that macrosystem, microsystem, mesosystem, and exosystem environments contribute to individual physical activity outcomes and that forces of change affect these environments and their interrelationships. These environments include macrolevel elements such as policies and communities, microlevel settings such as organizations and schools, and the mesosystem and exosystem linkages within and between environments.^{8,12} Mesosystem linkages connect microsystems together to directly influence youth physical activity (eg, combined interpersonal influence of a youth's teacher and peer support for physical activity), whereas exosystem linkages connect microsystems or macrosystems that do not include the individual. Microlevel settings often have the most direct effect on physical activity, whereas macrolevel settings often have more indirect effects but affect a greater number of individuals.^{8,12} Furthermore, changes to microlevel settings tend to have more direct effects that reflect changes in physical behavior more quickly than indirect effects aligned to macrolevel settings.

To understand how forces of change affect environments, and ultimately, youth physical activity, it is essential to identify the dimensions of physical activity. Y-PATHS organizes youth physical activity into 3 subcomponents to identify the dimensions of physical activity: *timing* (ie, school days in school and out-of-school and nonschool days), *how* (ie, functional, free play, organized, and transport), and *setting* (ie, school, natural areas, recreational facilities, shops and services, home, and travel infrastructure).⁷ Although some settings in Y-PATHS overlap with systems in EMPA (eg, schools), the 2 models serve different purposes. EMPA identifies factors in the ecologic milieu that influence physical activity, whereas Y-PATHS helps to characterize or measure all of the dimensions and benefits that are associated with physical activity. Furthermore, Y-PATHS subcomponents help users to focus beyond the total number of minutes of physical activity to include when, how, and where physical activity occurs. When synthesized with EMPA, Y-PATHS provides a comprehensive understanding of youth physical activity as well as factors that influence it (Figure 1). The frameworks were selected because of their complementary nature—one describes factors affecting physical activity, whereas the other describes characteristics of the physical activity.

Discussion

Effects of the Forces of Change on Youth Physical Activity in North America

Global changes in average weather patterns, increasing recognition of institutionalized discrimination, and the COVID-19 pandemic represent forces of change that alter youth physical activity (Table 1). These forces do not operate independently; rather, the interplay among forces has an impact on environments and creates syndemic scenarios that amplify existing physical activity inequities (ie, disparities in timing, how, setting, or rates of physical activity).¹³

Climate Change—Despite recognition of climate change by scientists for well over a century, it has gained widespread attention only in recent years.^{14,15} Among its other impacts, climate change has increased average global temperatures and the intensity, frequency, and duration of heat waves,¹⁶ which reduce physical activity due to thermal discomfort. For example, in 2019, peak use of a hike–bike trail in the United States shifted from midmorning and early evening during the summer to one midday peak during the winter.¹⁷ Researchers also have predicted an overall net decrease in trail use by pedestrians and cyclists by 2050 due to global warming under intermediate and high greenhouse gas emission scenarios.¹⁷ When faced with high temperatures, US children have been shown to engage in less moderate to vigorous physical activity and to seek shade during school recess.^{18,19} Furthermore, warming temperatures are projected to negatively impact recreational physical activities, such as skiing and snowboarding in winter seasons.²⁰ In Canada, Indigenous communities are disproportionately affected by climate change,^{21,22} with their modes and routes of transportation and traditional land-based activities disrupted by warmer temperatures that melt ice roads (ie, frozen waterways) and increase the risk of flooding and fires that force evacuation from territorial homes.^{23,24} The effects of climate change in Mexico, as discussed in more detail later, include higher temperatures and reduced rainfall, which will likely lead to similarly deleterious impacts on physical activity in other North American countries.²⁵

Case Study 1: Climate Change and Recent Physical Activity Promotion

Research in Mexico—In Mexico, only 10 of the 182 protected natural areas have climate action programs.²⁶ One of the protected natural areas, Sierra de Guadalupe, is subject to fires, pollution, crime, irregular settlements, and social stigma that originate from lack of coordination on climate action policies. Climate action programs and other public policies, in contrast, are related to greater management capacity, cooperation, and power of local actors.²⁷ Pérez-Paredes and Sosa, who conducted their research during the COVID-19 pandemic, showed how a large coalition of environmental, sports, and cultural groups that shared the goal of conservation of the Sierra de Guadalupe used a citizen science approach^{28,29} to keep the area clean and promote physical activity of the youth who use the protected natural areas via multiple physical activity events (eg, hiking tours).^{30–32} Results from the Sierra de Guadalupe study demonstrate how concerted climate action can be used to promote youth physical activity.³³ Other examples of climate change and physical activity research in Mexico include findings by Wong et al³⁴ showing that a 1 °C increase in ambient temperature is associated with a 2-minute reduction in sedentary time for young children (4- to 6-y-olds) and findings by Wilson et al³⁵ showing that collection of physical activity data among children may be more difficult when using certain technologies (eg, Actiheart Activity monitor). However, there is currently limited research demonstrating how climate change is affecting physical activity in Mexico, and more research is needed.

Increased Recognition of Institutionalized Discrimination—Institutionalized discrimination affects physical activity opportunities for youth across North America. For example, during the COVID-19 pandemic, racial tensions in the United States reached a boiling point, illuminating longstanding social and political injustices rooted in institutionalized discrimination.^{36,37} The murders of Ahmaud Arbery, George Floyd,

Breonna Taylor, and other Black people in the United States have led to discussions about the connection between institutionalized discrimination, overt racism, and physical activity.^{38,39} For example, Black people in the United States began voicing their fears and safety concerns in regard to being active in some *settings* (eg, running outdoors), modifying their exercise attire (eg, no hoodies), carrying identification while running, or ceasing to run outdoors altogether.^{40–43} In Canada, Black and Indigenous people are 92% and 75%, respectively, more likely to report being discriminated against than are White individuals.⁴⁴ This experience of institutionalized discrimination begins in childhood as Indigenous youth report facing discrimination that negatively affects their resources and opportunities to engage in physical activity.⁴⁵ One example of discrimination in Mexico is that LGBTQ + youth report feeling more uncomfortable playing organized sports (ie, *how*) and are more worried about their teammates' responses to a bad performance as compared with their non-LGBTQ+ peers.^{45,46}

Case Study 2: Recognition of Institutional Discrimination in Recent Physical Activity Promotion Research in the United States—Lee et al³⁹ discussed

opportunities to promote physical activity in response to the increased recognition of institutionalized discrimination in the United States. They cited schools and early care and education centers as microsystems ideally suited for equitable physical activity promotion. Schools provide consistent physical activity opportunities to all youth, social support (eg, teacher encouragement), and behavioral prompts (eg, games) that are important for maintaining physical activity.^{47,48} Furthermore, the US Community Preventive Services Task Force has identified school-based physical activity programs as an effective approach for decreasing a school's prevalence of obesity.^{49–51} Actionable strategies include offering multiple physical activity opportunities throughout the day (eg, before, during, and after school), engaging students in program development and delivery, using free physical activity resources (eg, brain breaks and Open Physical Education), and forming partnerships with local organizations that offer opportunities to promote physical activity (eg, Cooperative Extension and community centers). Some examples of school-based projects that engage the community include Sustainability via Active Garden Education,^{52,53} the Coordinated Approach to Child Health,^{49,54} and Strong Teens for Healthy Schools.⁵⁵ By using a community-engaged approach that includes students, school staff, and teachers throughout the process, these projects help to ensure that they are equitably providing physical activity for all youth. Furthermore, some of these projects consciously embed antidiscrimination elements. For example, Strong Teens for Healthy Schools requires schools to serve a high proportion of Black and Hispanic students (>40%) to be eligible to participate and then purposefully allows these students the freedom to choose their environmental change project (focused on physical activity or nutrition). Using this approach, Strong Teens for Healthy Schools elevates the voices of students that are often marginalized within their schools and society.

COVID-19 Pandemic—In March 2020, the World Health Organization declared COVID-19 a pandemic. Studies that examine the impact of the pandemic on youth have reported significant decreases in physical activity, matched by precipitous increases in sedentary behavior.^{56–60} In one study, 36% of parents reported that the COVID-19 pandemic

resulted in their children doing much less physical activity than during the same period a year before and that the *settings* of physical activity were also more likely to be in homes, garages, sidewalks, and roads.⁵⁹ Stay-at-home orders restricted physical activity to those with yards or walkable neighborhoods, and school closures eliminated recess and in-person physical education, shifting when physical activity occurred (ie, *timing*).^{56,61,62} For example, one study found that the switch to online physical education, as opposed to in-person physical education, resulted in a 10-minute decrease in weekly physical education time.⁶³ Widespread moratoria on cultural gatherings, youth sports leagues, park activities, and recreation facilities, as well as cancelations of pay-for-use memberships, activities, and resources (eg, gyms and dance classes), limited physical activity opportunities.⁶¹ Closures of green spaces limited citizens' use of these spaces for physical activity, affecting particularly lower income residents.⁶⁴ Furthermore, parks that remained open during the pandemic were observed to have lower use by children than before the pandemic.⁶⁵

Case Study 3: Recent Physical Activity and COVID-19 Research in Canada—

Benji et al⁶² presented how the COVID-19 pandemic reduced some access to organized physical activity opportunities for Indigenous youth in Canada. On reserves, communities erected blockades to prevent people from entering or leaving.⁶⁶ The closing of schools and social programs, and the inability of individuals to leave their often overcrowded house, exacerbated unhealthy emotional and physical situations for many.⁶⁷ Some positive effects, however, did emerge: Communities connected virtually and delivered cultural programming online, and social media was used to share traditional dance.^{67,68} Many Indigenous youths were able to spend more quality time with their families by engaging in traditional land-based practices, such as hunting, fishing, and gathering foods and medicines,⁶⁸ physical activity experiences that are vital to youth mental health and well-being.^{69,70} Traditional land-based practices are one way to encourage physical activity of Indigenous youth; however, these lands are increasingly threatened by climate change.⁷⁰

Insights Into Promoting Youth Physical Activity in Response to Forces of Change—

As the aforementioned research demonstrates, forces of change can work synergistically and/or antagonistically with one another to affect youth physical activity. Thus, it is important to critically evaluate any solution that promotes physical activity in response to a force of change. For example, during the COVID-19 pandemic, technology emerged as a major medium for promoting physical activity.⁷¹ Youth in low-income households or rural locations, however, often did not have reliable access to technology, further exacerbating health inequities when physical activity programs were delivered online.⁷² Physical education also was less effective when delivered online as compared with in-person.⁷³ In such a situation, the use of online physical activity promotion tools exacerbated existing physical activity inequities for low-income and rural families. Thus, synergistic solutions, such as pairing online physical activity with policies that provide a tablet or laptop for every student, can help to improve physical activity. Together, these solutions address the need for physical distance during a pandemic and can help to reduce inequities through ensuring that all students have the tools that they need to participate.

Similarities and Differences in the Ways in Which the Forces Impact Canada, Mexico, and the United States—As our aim was to highlight recent changes in youth physical activity that have resulted from 3 contemporary forces of change, we could not draw systematic inferences about consistencies or discrepancies between countries. However, some interesting similarities and differences did emerge. First, climate change appears to increase challenges to participating in and measuring physical activity across all 3 countries; however, studies from different countries show that increases in ambient temperature may have differential effects on activity outcomes (ie, reducing physical activity in the United States and reducing sedentary time in Mexico). Second, the increasing recognition of institutional discrimination in all 3 countries continues to highlight the negative impacts of discrimination on physical activity and many other health outcomes (eg, mental health). Although some research is beginning to embed antidiscrimination elements into physical activity programs, much more work is still needed for a variety of marginalized communities across all 3 countries. Finally, COVID-19 appeared to have a negative impact on physical activity across all 3 countries; however, it also promoted positive physical activity engagement within some communities (eg, engagement in traditional dance). More work is needed to identify opportunities to promote positive physical activity experiences in future public health crises.

Applications of Methodologies for Youth Physical Activity Promotion

Innovative solutions guided by intersectional perspectives can be effective tools for future youth physical activity research and promotion. Intersectionality acknowledges that everyone has a unique lens, and this lens shapes perspectives and structures of power.^{74,75} As researchers from multiple disciplines, we offer recommendations for using implementation science, digital health, and CBPR to promote youth physical activity (Table 2).

Implementation Science—Implementation science is the study of methods to promote the systematic uptake of evidence-based programs in practice.⁷⁶ Factors within individuals' environment play a major role in their ability to use evidence-based physical activity programs. Thus, understanding the impact of forces of change on physical activity environments is necessary when using evidence-based programs for physical activity promotion.^{77–80} Some useful implementation science tools include the US National Cancer Institute's repository of evidence-based physical activity programs⁸¹; the Health Equity Implementation Framework⁸²; the expanded Reach, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM) framework⁸³; and organizational readiness assessments.^{84,85} These tools take a multilevel approach to considering health equity and context when planning, implementing, and sustaining physical activity programs. They also can help to ensure that physical activity promotion initiatives are tailored for youths' cultures, preferences, and needs.

Digital Health Technologies—Digital health is the use of information and communication technologies to promote wellness.⁸⁶ Websites, wearable physical activity devices, and smartphone apps are common types of digital health technologies that are used for youth physical activity promotion.⁸⁷ In 2019, nearly 95% of teenagers reported having

access to smartphones, which have the potential to address environmental, space, time, and motivational barriers to physical activity.^{88,89} Examples of how digital health technologies can address forces of change include the ability to reach people virtually during a pandemic, improving physical safety by providing real-time location data, and reducing climate-related barriers for youth.⁹⁰ Some digital health technologies (eg, wearables and apps) also allow for behavioral and contextual data to be continuously collected. For example, technological interventions that involve machine learning can be used to provide real-time, tailored guidance on how, where, and when youth are physically active. This wealth of dynamic data can be used to develop strategies that are tailored to an individual's environment and provide real-time prompts to promote physical activity.⁹¹

Community-Based Participatory Research—CBPR is focused on social change that emphasizes partnerships leveraging the ingenuity of community knowledge and experience from promotion and practice with the scientific expertise of researchers.⁹² CBPR begins with a topic of importance to the community. It aims to combine knowledge with action and achieve social change to improve health outcomes and eliminate health disparities.^{93,94} CBPR can be utilized to bring together multisectoral coalitions with different priorities, advocate for large-scale policy changes, and use Indigenous knowledge to improve the saliency of research and practice agendas. CBPR methods can engage youth in the program planning process, increasing interest in physical activity.^{95,96} Engaging youth has many advantages, including enhanced buy-in, improved authenticity in the approach, and the development of programs that are tailored to the ways that youth prioritize for engaging in physical activity.⁷⁵⁻⁷⁷ Initiatives that engage youth, and, in particular, underserved youth, are also needed to help address environments that impede youths' participation in physical activity.⁹⁷

Insights for Promoting Youth Physical Activity Using Cross-Disciplinary

Methods—We offered 3 cross-disciplinary methodological research approaches that may be effective for enhancing youth physical activity promotion. Each approach, however, must be considered carefully to ensure it does not exacerbate existing health disparities. Here, we provide 3 additional considerations when promoting youth physical activity:

1. Carefully consider and measure adaptations to evidence-based interventions. For example, adaptations that occurred during a switch to a digital health platform during COVID-19 had the potential to alter the effectiveness of an intervention.⁹⁸ Reassessments and critical evaluations of adapted online programs are needed to establish an evidence base and ensure equitable impact before translating an intervention into practice.
2. Build multidisciplinary teams. For example, the Houston Mayor's Wellness Council worked together on bayou greening and improvement projects not only to improve the bayou for cyclists but also ensured that the paths could be used following flooding that is of increasing concern due to climate change.⁹⁹ By gathering input from multidisciplinary and intersectoral organizations, a sustainable solution increased the physical activity infrastructure and benefitted a diverse array of groups.

3. Prioritize the engagement of marginalized communities. Existing data on youth physical activity may not adequately represent marginalized communities (eg, LGBTQ+ youth) and, if used in making policy decisions, may continue to exacerbate disparities.³⁹ CBPR approaches should make concerted efforts to listen and respond to the needs of low-income individuals, people of color, and other marginalized individuals.

Conclusions

Climate change, institutionalized discrimination, and COVID-19 are large-scale forces of change that influence youths' physical activity environments and, ultimately, youth physical activity. These forces also interact to create positive, negative, or neutral effects on the *timing, how, and setting* of youth physical activity. As researchers, practitioners, and policymakers design and implement interventions and strategies in response to potential future forces of change, it is important to carefully study and evaluate such actions, use innovative and cross-sectoral intersectional methodologies, assess intended and potential unintended consequences, and design local and intercultural models that promote youth physical activity.

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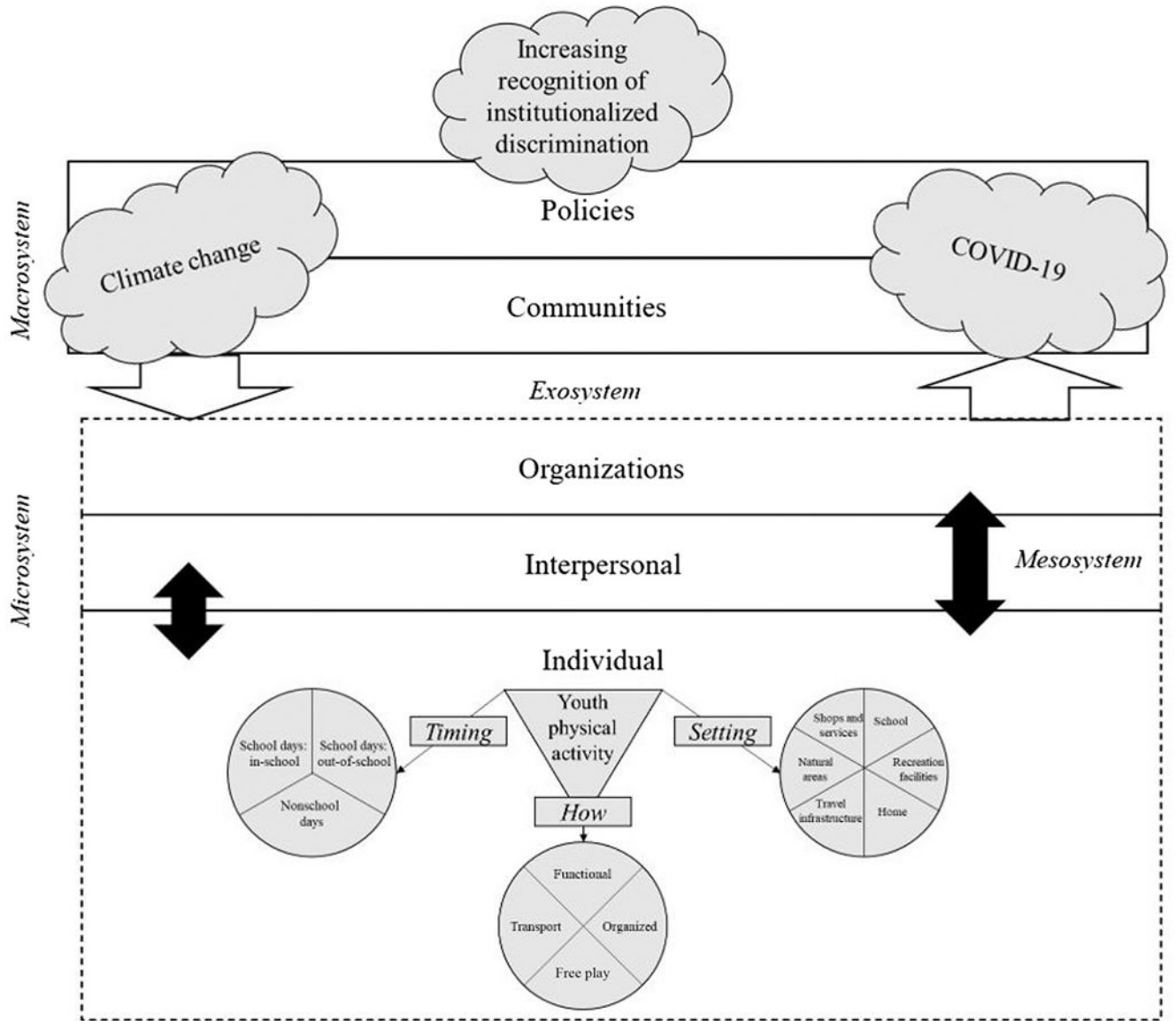


Figure 1 — Forces of change that affect the environments related to youth physical activity.

Table 1

Definitions and Effects of Forces of Change on Physical Activity

Force of change	Definition	Effect on physical activity (example)
Climate change	Long-term change in the average weather patterns that have come to define Earth's local, regional, and global climates. ¹⁰⁰	High ambient temperatures disrupted when, where, and how long youth were willing and able to be active. ¹⁷⁻¹⁹
Recognition of institutionalized discrimination	Recognition of prejudicial practices and policies within institutions that result in the systematic denial of resources and opportunities to members of certain groups. ¹⁰¹	Members of certain groups were deterred from being active alone in outdoor public spaces, and neighborhood inequities affected the availability of physical activity resources. ³⁹
COVID-19 pandemic	An infectious disease outbreak caused by the SARS-CoV-2 virus. ¹⁰²	Youths' screen time increased, and physical education classes shifted to online platforms. ¹⁰³

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Recommendations for Promoting Physical Activity in Response to Forces of Change

Table 2

Force of change	Strategy for physical activity promotion	Recommendations for promoting physical activity	Example
Climate change	Implementation science	When organizations adapt evidence-based interventions for physical activity, an evaluation of programming <i>setting</i> should be considered in the context of climate change.	The National Cancer Institute's Repository of Evidence-Based Programs allows users to filter by age and setting, which can help to identify youth-specific physical activity programs that may be more salient during climate change heat waves.
	Digital health	Interpersonal-, organizational-, or community-level digital physical activity interventions can be delivered in <i>settings</i> less affected by climate change.	Mobile phone apps whereby users share information can warn teens of trail obstacles (eg, floods) or imminent bad weather in terms of planning or canceling physical activity events (eg, school or club sports).
	Community-based participatory research	Climate action policies or plans can engage community stakeholders to think about <i>how</i> to include physical activity.	A coalition of several groups shared the goal of conservation of the Sierra de Guadalupe. Using a citizen science approach, these groups kept the area clean and free from crime and promoted physical activity of youth.
Increasing recognition of institutionalized discrimination	Implementation science	Implementation science equity frameworks can identify how discrimination is creating inequities in the <i>timing, how, or settings</i> of organization- or community-level physical activity opportunities.	Healthy equity implementation and expanded RE-AIM frameworks take a multilevel approach to considering health equity based on youths' contexts and environments.
	Digital health	Digital health technologies can provide real-time feedback to friends or family members (ie, interpersonal) as people engage in physical activity in <i>settings</i> where they are more likely discriminated against.	Apps such as Find My Friends, Life360, and Glympse allow youth to track friends or parents to track their kids as they engage in physical activity and, in some cases, allow users to send distress signals.
	Community-based participatory research	Community engagement initiatives can identify and advocate to change physical activity policies that restrict the types (eg, <i>how</i>) of physical activity in which people participate.	Community groups use Title IX to change policies related to gender equality in sports participation, including increasing the availability of school sports for girls.
COVID-19	Implementation science	Contextual assessments can help organizations to preemptively identify how COVID-19 created barriers and/or facilitators to implementing physical activity interventions in their <i>setting</i> .	Organizational readiness assessments can identify how COVID-19 affects general capacity, innovation-specific capacity, and motivational factors related to physical activity program delivery in the settings that most impact youth physical activity.
	Digital health	Interpersonal-, organizational-, or community-level digital physical activity interventions can be delivered in <i>settings</i> less affected by COVID-19.	Online physical education allowed for physical distancing during the COVID-19 pandemic.
	Community-based participatory research	Partnerships between researchers and communities can help to identify positive types (eg, <i>how</i>) of physical activity promotion that communities engaged in during COVID-19.	Traditional land-based practices are one way to encourage physical activity of Indigenous youth.

Abbreviations: EMPA, ecological model of physical activity; RE-AIM, Reach, Effectiveness, Adoption, Implementation, and Maintenance framework; Y-PATHS, youth physical activity timing, how, and setting. Note: Bolded words are levels of EMPA; italicized words are components of Y-PATHS.