

Opinion

# Physical activity and prevention of chronic disease in Chinese youth: A public health approach

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Globally, physical activity (PA) has been recognized as one of the important lifestyle behaviors that brings major health benefits to, and affects the healthy growth of, school-aged children and adolescents.<sup>1–3</sup> Yet, epidemiologic data<sup>4</sup> indicate that most children and adolescents do not engage in sufficient activities to meet the 60-min daily moderate-to-vigorous PA (MVPA) recommended in the World Health Organization's guidelines.<sup>5</sup> Research also shows that children who have low levels of PA are more likely to have a high risk of being overweight or obese,<sup>6</sup> a health state that, if not appropriately modified, will carry into adulthood,<sup>7,8</sup> along with the increased likelihood of developing additional health problems, including an increased risk for heart disease, caused by adult obesity.<sup>9</sup>

In China, 3 decades of unprecedented, rapid economic development have resulted in high rates of urbanization and accelerated advances in technology, which in turn have led to major changes in the health behaviors<sup>10,11</sup> of its population of more than 1.3 billion people.<sup>12</sup> The resulting social-economic transformation has caused Chinese society to gradually move toward adopting an unhealthy lifestyle characterized by physical inactivity and poor dietary habits.<sup>11,13</sup> Among China's school-aged population of approximately 170 million children and adolescents,<sup>14</sup> who face strong cultural and social pressure to achieve academic excellence,<sup>15</sup> epidemiologic studies consistently show disappointingly low levels of PA<sup>16</sup> and fitness.<sup>17–19</sup>

Over the past 20 years, there has been an increasing number of studies, conducted at both the regional and national levels, on Chinese school-aged children's PA.<sup>15,20–25</sup> An early landmark study of 1997 national survey data showed that 72% of Chinese youth engaged in in-school MVPA, with as few as 8% reporting MVPA outside the school setting.<sup>15</sup> However, in 2010 another national survey study of 166,812 children found that only 22% of students engaged in any type of PA for 60 min/day.<sup>20</sup> Findings from subsequent studies have shown

little or no evidence of any improvement in terms of the proportion of children and adolescents who met recommended PA guidelines. For example, national surveillance studies using 2016 and 2017 data from Physical Activity and Fitness in China—The Youth Study (PAFCTYS) showed that only 30% of children and adolescents met MVPA guidelines in 2016, with the percentage increasing to only 34% in 2017.<sup>22,23</sup> In 2016, only 63% of children and adolescents met the screen viewing time guidelines of 2 h or less daily, with the percentage rising to only 65% in 2017.<sup>23,26</sup>

Physical inactivity, including being physically underactive or engaging in increased screen viewing time, can increase the likelihood of developing unhealthy body weight,<sup>27</sup> which can, in turn, lead to an increased health risk for hyperlipidemia, high blood pressure, type 2 diabetes, low bone density, and other diseases.<sup>28</sup> In this regard, there has been an increasing number of studies indicating a high prevalence of, and continuously rising trends in, overweight and obesity among Chinese school-aged children and adolescents.<sup>23,26,29,30</sup> Surveillance data from the 2016 PAFCTYS survey<sup>26</sup> showed 14% overweight and 11.9% obesity among youth, with the prevalence of overweight increasing by 1 percentage point (to 15%) in 2017.<sup>23</sup> National surveys spanning the years 1985 to 2014 showed that among Chinese school-aged children, overweight prevalence continually increased from 1.1% in 1985 to 20.4% in 2014<sup>29</sup> and obesity increased from 0.5% to 7.3% in the same period.<sup>30</sup> It is projected that the prevalence of childhood overweight/obesity will reach 28% (or 49.5 million children) by 2030.<sup>30</sup>

Clearly, physical inactivity and low levels of PA are a global health problem<sup>31–34</sup> and are particularly serious in China, especially among youth. At the same time, low levels of PA, coupled with the obesogenic environments,<sup>35</sup> lack of safe and accessible exercise facilities,<sup>36</sup> and socially imposed pressures to excel scholastically,<sup>15,37</sup> present a significant challenge to the realization of the goals established in the *Healthy China 2030* blueprint,<sup>38</sup> which emphasizes the need for Chinese youth to engage in at least 1 h/day of school-based PA and to have at least 25% of the Chinese youth population

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achieve an excellent rating in fitness. Therefore, there is an urgent need for action,<sup>39,40</sup> including developing and prioritizing policies, strategies, and campaigns to increase and scale up levels of PA among the youth population in China. These concerted efforts require a broad public health approach,<sup>41</sup> along with multilevel, evidence-based strategies<sup>42</sup> aimed at promoting PA and preventing obesity and other chronic diseases in Chinese youth.

A promising public health approach is to adopt a social-ecological perspective<sup>43,44</sup> that emphasizes multiple levels of influence on PA behaviors and interactions across all levels of influence. Such an approach provides an overarching conceptual framework for understanding barriers and facilitators of PA, in that it focuses on young people not only at the intra-individual and inter-individual level, but also on contexts related to the broad social and physical environment. In this context, families, friends and peers, formal and informal organizations, neighborhood and community associates, the design of urban and rural environments and facilities, and public policies and practices can all play a role in promoting PA. Although this approach holds great potential, to date there has been a lack of empirical studies on PA that have determined the validity of using this approach among Chinese children and adolescents.

There is also a public health need for developing and implementing interventions targeting PA-related behaviors among Chinese youth. Current evidence from the PA literature suggests that, although PA interventions can lead to improved levels of PA and health outcomes for children and adolescents,<sup>45–49</sup> interventions aimed at increasing PA among this population are generally weak in terms of effect sizes.<sup>50,51</sup> This lack of strong intervention efficacy could be due to the absence of theoretically guided interventions.<sup>52</sup> Therefore, the development of theoretically based and culturally tailored health-enhancing PA interventions is urgently needed to respond to the public health need for increasing PA and decreasing sedentary behavior among children. The development of such interventions should be based on well-established theories, such as those found in current social-ecological models,<sup>43,44</sup> that take into account multiple influences (i.e., targeted at the intra-personal, inter-personal, organizational, community, and public policy levels). One recent study of a policy-driven, multilevel intervention developed within the social-ecological framework showed promising results in improving body composition and physical fitness among young Chinese preschool children.<sup>53</sup>

Currently, there are PA promotion policies for Chinese schools<sup>54,55</sup> and the nation's physical education system.<sup>40</sup> However, the extent to which these policies have made an impact on transforming the current physical education system, and changing the level of PA among school-aged children, remains largely unknown. In addition, there is a lack of PA policies that are evidence-based and involve multiple societal sectors.<sup>56</sup> In this regard, Pate and colleagues<sup>56</sup> have proposed a comprehensive multisector strategy aimed at increasing PA in adolescents who live in developed and developing countries. Similarly, the Centers for Disease Control and Prevention in the United States has developed strategies at the community

level to increase PA and prevent obesity and other chronic diseases.<sup>42</sup> In both instances, a social-ecological perspective was adopted by considering evidence-based programs implemented in settings that included families, schools, and communities. These public health strategies are well suited and positioned to serve as a model for building a culturally appropriate PA guide for youth populations in China.

Last, PA promotion should consider underserved (i.e., socially and economically disadvantaged) and vulnerable populations that are least likely to engage in sufficient PA, and thus are at increased health risk.<sup>57</sup> In China, studies indicate that children in suburban/rural regions engage in less activity,<sup>16</sup> are less likely to meet screen viewing time guidelines (sedentary behaviors),<sup>23</sup> and have a higher prevalence of obesity<sup>30</sup> than those living in urban communities. Therefore, for optimal impact, specific PA policies and targeted and tailored school-, community-, and policy-level interventions are needed, along with improvements in the built environment (e.g., availability and accessibility of local exercise facilities),<sup>36</sup> to increase PA among populations of underserved children who may face various physical and mental health problems.<sup>58–60</sup>

In conclusion, the proportion of Chinese children and adolescents who engage in a level of PA that can promote their health is far smaller than desired. The prevalence of physical inactivity, low levels of fitness, and unhealthy weight in the school-aged population in China is sufficiently high that it poses significant threats to this population's healthy growth. To reverse the current status and unhealthy trends, a public health approach that is based on a social-ecological model is needed to understand factors that contribute to physical inactivity. This information can then be used to develop effective and culturally appropriate and relevant PA promotion policies, initiatives, and interventions. These concerted efforts can facilitate the development and implementation of evidence-based interventions aimed at increasing PA and sport activities, which, in addition to helping meet the goals of *Healthy China 2030*, can prevent the development and early onset of chronic diseases among Chinese children and adolescents.

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## Competing interests

The authors declare that they have no competing interests.

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