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# Physical Activity Technology for Supporting Mental Health in Families

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**Abstract**

Physical activity has been shown to be beneficial for improving mental wellness. In this position paper, we draw from our research focusing on family physical activity technologies with a goal to support low-income populations to live an active life. Such technologies have the interventional potential to enhance mental wellness. We then suggest the importance for such technologies to support social interactions symbolically over social places. Finally, we suggest research directions to better facilitate such social interactions towards improving mental wellbeing.

**Author Keywords**

Physical activity, mental health, poverty, spaces, places

**Introduction**

Poverty is burdening low-income adults and children with increased risks of mental health illness [12] in two ways. First, poverty creates stressors that further enable the development of mental health conditions, namely from economic strains, housing instability, exposure to violence, and discrimination [12]. Second, poverty limits access to evidence-based mental health services and treatment. For example, single parent status and neighborhood disadvantages are associated with lowered access to mental health services.

## Spaces and Places

Harrison and Dourish proposed an analytic distinction between spaces and places [4]. These concepts are being used throughout the paper.

**Space** is often defined as a natural fact, the reality where actions can happen.

**Place** is socially constructed though interpersonal interactions when individuals experienced spaces.

While social interactions on spaces produce places, they also redefine spaces as well. A park in a neighborhood allows social interactions to happen, thus allows individual to give meanings to the said park (e.g., relaxing, safe). In turn, these interactions allow individual to redefine the park (e.g., a park become more accessible after a neighborhood action).

Physical activity (PA) can improve mental health by reducing symptoms of depression and anxiety [1]. However, poverty is often a barrier to active living [6] due to the limited opportunity to be active in low-income neighborhoods [5]. Thus, improving mental health in low-income context through PA promotion requires interventions at the policy and societal level [13], as well as at the interpersonal level.

In this position paper, we draw our six-year research in PA promotion technologies in low-income context [7–11] to propose design directions for technology-based resources to enhance mental wellness. We will also present design challenges in this research space.

## Design Opportunities

Our research consists of one evaluation studies of consumer fitness trackers [7,9] and two novel fitness promotion tools [8,11]. These studies detailed qualitative findings from the accounts of 45 families. A key theme from these studies is the centrality of social relationships and interactions in the way families use fitness technologies to be active.

One factor that drives how much caregivers' motivation to be engaged with fitness apps is the caregivers' long-term aspirations for their children [9]. While caregivers' aspirations are very diverse, they are unified by an intense desire to ensure their children's future wellbeing. Some parents seek to ensure their children are active in order to minimize health issues that the parent has experienced. When caregivers did not see an immediate risk to their children's physical health, they often prioritized their children's educational advancement to guarantee life-long success. Thus, while avoiding illness and achieving educational success

are not immediately similar, they all point towards bettering their children's future wellbeing.

A potential design direction is to frame fitness apps as tools that offer near term benefits, so caregivers are more motivated to engage with such apps. Given that PA can improve children's mental health by reducing stress [1], it may be beneficial to present PA apps as resources for helping children manage everyday stress.

Another factor that enabled families to be active in their neighborhood is the family's relationship with their neighbors. Although low-income neighborhoods in the U.S. are often associated with higher crime rates, some families in our study felt comfortable to be active in the *places* in their neighborhoods if they have social connections that heighten the feeling of community. These social connections are often the result of personal histories through interpersonal interactions in *spaces*, which emphasized the importance of social interactions (see Figure 1). For example, frequent social interactions in a local park can enhance the feeling of community and comfort in that park.

However, poverty often reduces families' abilities to engage in recreational PA. As a result, their ability to be involved in social interactions is limited. Therefore, a potential design direction is using technology to facilitate social interactions with a goal to develop and solidify neighborhood social interactions. Such interactions can enhance the feeling of comfort to be active in one's neighborhood.

Furthermore, in the context of mental health research, the importance of human relationships and interactions resonated with Burgess et al.'s work on the sociality of

**Figure 1.** Distinction between spaces and places.

depression self-management [3]. This work emphasized the importance of *diffuse sociality* — being in close proximity with others without necessarily engaging in direct interactions [3].

Collectively, these findings underscore the centrality of social relationships and social interactions in fitness technologies as mental health support resources.

## Discussion

Our findings point to two design directions. First, the diverse aspirations that caregivers had for their children necessitate physical activity technologies for families to be designed to address a broad range of wellness outcomes [2], which includes physical fitness, mental health, and also education. In other words, family health technologies should be designed as tools for achieving the multiplicity of wellness goals that caregivers had.

Second, the centrality of sociality suggests the need for physical activity technologies to catalyze interpersonal interactions in *spaces* that enhance the comfort to be active in those *places* (see **Figure 1**) [4]. The physical activeness supported by such technologies has the interventional potentials to enhance mental wellness. To complement physical social interaction in *spaces*, perhaps technology can facilitate social interactions symbolically by inviting individuals to interact digitally over social *places*. In this work, we propose a design where an individual can engage in social interactions in the form of sharing verbal stories on a digital map (Figure 2).

We concur that designing for symbolic interactions over places presents a challenge. Moving diffuse sociality to

a digital realm requires a better understanding of the essential properties of social interactions that enable the production of social places and also diffuse sociality.

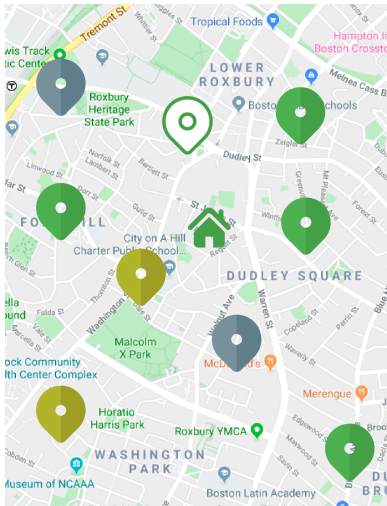
A broader question is to understand how the inequality in access, uptake, adherence, and effectiveness of health interventions that are being faced by low-income adults and children [14] will inhibit them to achieve physical and mental health. In short, more work is also needed to examine this research space.

## Conclusion

Poverty leads to increased exposure to psychological stress that can contribute to mental health conditions. Although physical activity has been shown to improve mental health, low-income adults and children are often facing many barriers to living an active life. Our six years of physical activity research with a total of 45 families suggests the importance of social relationships and social interactions in physical activity technologies. As we suggest the interventional potential of physical activity technologies to enhance mental wellness, we also underscore the need for such technologies to facilitate social interactions symbolically in social places. However, more work is needed to understand the essential properties of social interactions that can enable physical fitness and mental wellbeing.

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**Figure 2.** Sharing stories (green markers) on a digital map. The goal is to enable social interactions symbolically over physical spaces.

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