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Multi-dimensional interacting constraints on physical activity behaviours in the Finnish population

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Key Points

Despite having extensive sports facilities and physical activity recommendations physical activity levels are declining in Finland.

The most dramatic decrease in physical activity within the Finnish population occurs around puberty, where girls become less active than boys.

One of the possible reasons for increased inactivity may be that the design of built environments does not consider psychological or social affordances for physical activity.

Abstract

Finnish sports organisations, local and federal government and healthcare organisations have widely adopted World Health Organization's and national recommendations for physical activity for different age groups. However, studies have indicated that only 46 % of 3-year-old preschool children, approximately 50% of primary school students (7–12 years), 10 - 17% of secondary school students (13–15 years) and 16 % of Finnish adults (20-54 years old) attain those recommendations.

In Finland there are 33 620 built sports facilities and over 9 000 sport clubs so there are many possibilities for physical activity, yet people are still rather inactive. In this paper we argue that availability of facilities, although they are an important element, is not enough to promote physical activity. It is possible that current built physical environmental design do not fulfil people's' motives to participate in physical activity. More emphasis should be paid into the design and operation of the facilities to develop new affordances for physical activity.

1. Introduction

It has been well-documented that physical activity has many positive effects on individuals' health, well-being and cognition [1-2]. Many countries have launched recommendations and guidelines for sufficient daily amounts of physical activity in order to help people obtain positive health benefits from physical activity [3]. For example, according to the Finnish national physical activity recommendations, children in early education (below 7 years of age) and students in elementary school (7-12 years) should be physically active two hours a day [4-5]. In secondary schools, the recommendation is for 90 minutes of physical activity a day [5]. According to the physical activity recommendations directed to children and adolescents, physical activity should be moderate-to-vigorous activities implemented in a variety of ways suitable for each age group [4-5]. The World Health Organization [3] and US physical activity guidelines [6] have recommended that all children and adolescents should attain moderate-to-vigorous levels of physical activity (MVPA) for at least 60 minutes per day. Self-reported (3071 participants) and objectively measured (698 participants) Finnish studies have indicated that only 46 % of 3-year-old preschool children [7], approximately 50% of primary school students (7–12 years) [8-9] and 10 - 17% of secondary school students (13–15 years) [8-9] attain at least 60 minutes of MVPA a day. Declining amount of individuals reaching the recommended weekly physical activity across age groups is a particularly strong trend among Finnish youth when compared to other countries [10].

Physical activity recommendation for adults in Finland [10] following WHO recommendations [3], suggest that adults should undertake a total of at least 2 h 30 min per week of moderate-intensity aerobic physical activity. This total can be accumulated in repeated bouts of at least 10 minutes duration. Alternatively, one can perform vigorous-intensity aerobic physical activity with an accumulated total of at least 1 h 15 min per week. Furthermore, it is recommended that everyone needs to undertake muscle-strengthening and balance training activities at least twice a week. Research has demonstrated that 16 % of Finnish adults (20-54 years old) fulfil both sides of physical activity recommendation i.e. do enough aerobic physical activity and muscle training, men somewhat less (15%) than women (17%) [12]. If only balance or muscle strengthening physical activity is included in analyses, the amount of those adults fulfilling the physical activity recommendation increases to 36%. Still, current data indicate that almost a half (48%) of Finnish adult population perform insufficient amount of physical activity. [12]

Insufficient levels of physical activity in Finland have contributed to an increasing prevalence of overweight and obesity among the population [3]. This has been identified as a major cost to the Finnish economy, responsible for 1.7 % - 7 % of total healthcare costs [13] and an estimated €330 million in health and social care costs in 2011, equating to €61/inhabitant [14]. When the increasing prevalence of lifestyle diseases such as type I and II diabetes is taken into account, the total cost of insufficient levels of physical activity in Finland is estimated to be between €1-2 billion annually, or approximately €185 - 370/inhabitant) [15]. Consideration of all these factors shows that one of the challenges in Finnish society in the future is to increase physical activity engagement within all age groups. Studies conducted on the Finnish population have also indicated that girls are less active than boys [10, 8]. Additionally, it has been recognized that the most dramatic decrease in physical activity within the Finnish population occurs at puberty [16]. These findings concerning physical activity participation in girls, especially at adolescence, have raised special concerns in the Finnish public health system in the past few years and related changes have been made to the physical education curriculum. The aim of the new curriculum [17] that will be implemented in autumn 2016 is to promote physical, social and psychological well-being and physical activity as well as to reduce levels of inactivity during the school day.

Physical activity engagement has been explained and understood by many models of behavioural change and participation motivation in addition to enhanced provision of facilities and access to leisure physical activity environments, such as parks, nature parks and forests [16,18-21]. These models explain different psychological, social and physical factors of physical activity engagement. However, the theory of ecological dynamics [22-24] may also provide a useful framework to understand physical activity participation, because of its emphasis on the person-environment relationship as a relevant scale of analysis. To date there have been few attempts to utilize an ecological dynamics approach in studying the engagement process in physical activity (but see Davids, Araujo & Brymer, 2016, for an exception [25]). The ecological dynamics framework considers the continuous interactions between individuals and an exercise environment, suggesting that human behaviours in these environments can be predicted by the utilization of affordances or opportunities for action [23]. Affordances can be seen as invitations to act or behave in a particular environment. Environments where people are engaged in physical activity may include a variety of physical, psychological, and social

affordances which may increase or decrease their possibility to engage in physical activity. Therefore, physical activity participation may be usefully analysed from the perspective of affordances that are designed into activity enhancing environments.

In Finnish built environments, there are many possibilities for physical activity, yet people are still rather inactive. The specific purposes of this article are: a) to review Finnish built physical activity environments, physical activity organization, legislation, and financing, and b), to discuss the role of physical, psychological and social affordances of physical activity environments in relation to physical activity participation. In this paper, we argue that one of the possible reasons for increased inactivity of people may be that the design of built environments does not include psychological affordances for participation in physical activity.

2. Built physical activity environments in Finland

In Finland the government and public authorities have made substantial efforts to enhance physical activity in the entire population through legislation, financing the building of physical activity environments, and supporting the activities of sports clubs.

Data on Finland's sport facilities are collected in the national public Geographic Information System (GIS) 'LIPAS –database' [26] that contains nationwide geographic and economic information for Finnish sport sites, recreational areas, and outdoor routes. LIPAS-database is maintained by the University of Jyväskylä, Faculty of Sport and Health Sciences and is funded by the Finnish Ministry of Education and Culture. The LIPAS database includes 33620 sport facilities. The database is updated by the Finnish municipalities (local authorities) and includes mainly publicly funded and sustained sport sites. As the information gathering and updating is delegated to local authorities, LIPAS-database might include some outdated data. Despite this challenge, the database still gives a good overall picture of the state of the Finnish sports facilities.

In Finland there are 33620 total built sport facilities. The most common sports facilities are outdoor fields and sports parks with one site per 411 citizens. Other common built environments are

indoor facilities with one site per 827 citizens and cross-country sports facilities with 851 citizens per site. The classification and amount of sports facilities in Finland can be seen from table 1.

In Finland public policies have played a substantial role in physical activity promotion. The first Sport Act was passed in 1980 with the aim to promote equality by and in sports by providing equal sports services and facilities regardless of living location, sex or socio-economic status. Sport was viewed as an appropriate vehicle to promote health and to reduce disparities in well-being between citizens of different social classes. The main stipulations in the Sports Act were for the building of physical infrastructure and facilities and financial support to the third sector (sports clubs, organisations, etc.) and sports organisations. The Act stipulated that the public sector would be responsible for building and maintaining the sports infrastructure and facilities, while the third sector would take the responsibility for national and local sports activity. [27]

In 2013 the Ministry of Education and Culture funded initiatives designed to enhance physical activity and sports with a grant of €147 million (€27 per inhabitant). Children's and adolescents' physical activities were also supported by the government through voluntary sports organisations (€43.9 million in 2012) and programmes (€5.5 million in 2012). [28] Government aid also supports municipalities to organise sport activities at a cost of around €12 per inhabitant.

Classification of built physical activity facilities

Table 1. Sports facilities in Finland

Facility type	Total	Per capita users per site	Categorized facility type	Sports facilities
Recreational destinations and services	3266	1669.1	Recreational and outdoor areas	Neighbourhood park Outdoor area Hiking area Multipurpose area with recreational services Tourist services area Recreational forest Wilderness area Other nature conservation area with recreational services National park National hiking area Leisure park
			Hiking facilities	Information Nature observation tower Boat dock Fishing area/spot Camping Hut Boating services Cooking facilities Outdoor/ski lodge Lean-to, goahti (Lapp tent shelter) or 'kammi' earth lodge
Outdoor fields and sports parks	13 262	411.0	Neighbourhood sports facilities and parks	Parkour area Sports park Neighbourhood sports area Fitness training park Cycling area Velodrome Skateboarding/roller-blading rink
			Athletics fields and venues	Athletics training area Athletics field

			Ball games courts	Basketball court Volleyball court Beach volleyball court Ball field Football stadium Baseball stadium Tennis court area Roller hockey field
			Ice sports areas and sites with natural ice	Mechanically frozen open-air ice rink Ice-skating field Rink Speed-skating track Ice-skating route Downhill skating track
			Golf courses	Golf training area Golf course Golf training hall Minigolf course
Indoor sports facilities	6 593	826.8	Fitness centres and sports halls	Gymnastics hall Fitness centre Weight training hall Martial arts hall Gymnasium
			Sports halls	Petanque hall Indoor skatepark Multipurpose hall/arena Sports hall Floorball hall Badminton hall Squash hall Tennis hall Football hall
			Indoor venues for various sports	Stand-alone athletics venue Artistic gymnastics facility Table tennis venue Fencing venue Dance studio Indoor shooting range Indoor climbing wall Parkour hall
			Ice-skating arenas	Training ice arena Speed-skating hall

				Competition ice arena
			Bowling alleys	Bowling alley
Water sports facilities	2 989	1823.8	Indoor swimming pools, halls and spas	Public indoor swimming pool Swimming pool Spa
			Open air pools and beaches	Unsupervised beach Winter swimming area Open-air pool Supervised beach
Cross-country sports facilities	6 403	851.4	Ski slopes and downhill ski resorts	Ski slopes and downhill ski resorts
			Covered winter sports facilities	Curling sheet Snowboarding tunnel Downhill skiing hall Ski tunnel
			Ski jumping hills	Ski jumping hill for training Ski jumping hill
			Sports and outdoor recreation routes	Walking route/outdoor route Cross-country biking route Nature trail Hiking route Biking route Disc golf course Dog skjoring track Horse track Official snowmobile route Ski track Jogging track Canoe route Unofficial snowmobile route Water route
			Orienteering areas	Orienteering area Mountain bike orienteering area Ski orienteering area
			Cross-country ski resorts	Training area for biathlon Ski competition centre Cross-country ski park Biathlon centre

			Climbing venues	Open-air climbing wall Climbing rock
			Shooting sports facilities	Open-air shooting range Shooting sports centre Field archery course Archery range
Boating, aviation and motor sports	307	17756.6	Boating sports facilities	Rowing stadium Water ski area Sailing area Motor boat sports area Rapid canoeing centre Indoor training facility for rowing and canoeing
			Sport aviation areas	Sport aviation area
			Motor sports areas	Motor sports centre Motorcycling area Formula race track Dragstrip Kart circuit Everyman racing and rallycross track Ice speedway track
Animal sports areas	750	7268.4	Equestrian sports	Equestrian field Riding manège [arena, riding ring] Show jumping field Horse racing track
			Dog sports	Dog sports area Dog sports hall
Maintenance/service buildings	52	104832.3	Maintenance/service buildings	Maintenance/service buildings

3. The role of sports clubs

The Finnish sports system relies strongly on local-level sports club activities. There are about 9 000 active sports clubs in Finland [29]. The Finnish clubs are mainly based on voluntary civil activity, non-profit making, funded by their members and targeted at children and adolescents [30]. The recent national report highlights that a competitive orientation, early commencement to club activities and focusing on one sport domain, are prevailing trends in the club activities for youth [31]. Overall, about half of Finnish children and adolescents actively participate in sports club activities, although there is a strong declining trend with age during adolescence [10,31]. In comparison, about 15-20% of adults participate in club activities [30,32].

4. Discussion

Our article shows that there are 33 000 built physical activity environments in Finland. However, the majority of the population is still very inactive. It is noteworthy that between the age of 11 and 13 years Finnish children are considered physically very active in international comparisons, but activity levels decrease rapidly after 13 years of age, compared to other developed countries [10]. We may then infer that built environments are not enough to invite large cohorts of people to participate in physical activity and, therefore, also design of physical activity should be taken into account. It is possible that current built physical environmental design do not fulfil people's motives to participate in physical activity. Different psychological and motivational theories can provide useful frameworks to take into account when planning and building physical activity environments and their content, including psycho-social constraints to engaging in physical activity. Further research about how these theories can be applied in an ecological dynamics context to promote physical activity is needed.

Here we have argued that the psychological and social needs can be seen as environmental psycho-social affordances which invite people to participate in physical activity, or to reject these opportunities for action. Special emphasis should be placed on

understanding how to build affordances for motivating people of different age groups for physical activity. Modern mobile and sensor technologies provide new opportunities for environmental design to enhance physical activity by using digital technology to motivate and measure people's movements in sensory-rich, mediated, multimedia environments. They also allow creation of opportunities to explore, discover, create and adapt people's relationships with both physical and virtual elements and objects as well as nearby and physically-remote others. Modern technologies provide design opportunities to use all their perceptual systems (e.g., visual, somatosensory, acoustic) to develop physical, cognitive, emotional and social skills and experiences through the medium of movement and fulfilling people's psycho-social needs. Interactive sound and music elements can also be designed into the environments (i.e., play landscapes). When coupled coherently with the person's actions and movements, sonic feedback potentially "resonates" with our spatio-kinaesthetic knowledge and imagination, and may even result in tactile sensations related to the movement [35].

With the aim of promoting physical activity it is proposed to use more design- and content oriented approaches to infrastructure and environment planning. Besides having affordances for physical activity the environment should also be suitable for other purposes fulfilling other psycho-social needs, e.g., arranging events, having picnics, meeting of friends etc. where people fulfil their psycho-social needs and are also attracted to participate in physical activity and training in the form of Frisbee golf or other activity, play or game. It has to be noted that psycho-social needs differ between age groups. Affordances for physical activity are different between user-groups (i.e. children, families, elderly special groups etc.) where some prefer play, skills, enjoyment or relatedness and other physical performance or competition.

Some examples of the new approach can be seen in commercial solutions for example in street workout equipment and parkour parks where autonomy and competence are enhanced by providing several options for exercises. Some examples have also included smart tags and codes to allow online video streaming of exercise instructions. Unfortunately

these good examples have not yet been fully utilised in system-level. Affordances for physical activity could also be implemented in every-day settings. Examples for these can be surface materials and designs inside grocery store to invite practising of balance skills, public spaces where people meet with street workout equipment and playgrounds designed also for adult physical activity.

5. Conclusion

The ecological dynamics theoretical framework suggests that affordances are both subjective and objective. This means that they should be seen as invitations for action [33]. Since they are invitations, they can be accepted or rejected by people. Therefore, when we design physical activity facilities, we should understand how to design different affordances for physical activity. After all, an affordance for a young child to be active is different from an affordance for an elderly person to be active. The same consideration applies to males versus females, people of different cultures, and able-bodied and disabled people, etc. Therefore, a whole landscape of affordances needs to be designed so that different individuals with different needs are invited to engage in physical activity [34]. This approach requires a multi-disciplinary collaboration between ecological dynamists, developmental psychologists, gerontologists, educators, movement scientists, sociologists, urban planners, designers and engineers.

Compliance with Ethical Standards

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Conflicts of Interest

Aki Karjalainen, Jarmo Liukkonen, Sami Kokko and Timo Jaakkola declare that they have no conflicts of interest relevant to the content of this review.

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