The Effectiveness of Environmental Design for Physical Activities Promotion: Review

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Abstract: Mexico is the second country with obesity in the world, which attributed more than 68 thousand deaths annually. The growth of obesity statistics is related to the population’s overconsumption of calories and the lack of human energy expended, both linked to the environments in which we live, work, and play. A literature search was conducted to analyse the effectiveness of design for physical activities promotion.

Design in every field had played an important role as a support of the problem with products and services that develop unhealthy customs but recently an increasing number of studies have shown that environmental design can play as a promoter of physical activity, battling the biggest problem of public health; metabolic syndrome and related diseases.

An overview of different cases of environmental active design interventions, the relationship between physical activity with obesity, as well as projections of how to apply it in Mexico are presented.

Keywords: Obesity, Sedentarism, Active Design, Environmental Design, Innovation.

1. Introduction

Environmental design has helped humanity as a tool to solve the biggest crisis in communities, since the disappearance of epidemics like the cholera in London in 1854, thanks to the method of mapping points of John Snow that consisted in the geolocalization of the deaths and the identification of a water pump as the origin of the problem (Jaime Cerda L., 2007) (Image 1), until the prevention of violence and crimes in Latin America and Caribbean in 2008, with the methodology of CPTED (Crime Prevention Through Environmental Design).
Prevention Through Environmental Design) that is understood as a pragmatic response to the criminal problem, based on the principle that the space, design, and environment are factors that can be modified easier than the aggressor. (Macarena Rau, 2009)

Figure 1. Map made by John Snow of the deaths attributed to cholera in the Broad Street8 area. The black rectangles represent the deaths. The water pump was located between Broad & Cambridge Street.

The source of this material is from public domain since the author death

As an example of these tendencies, the certification system LEED (Leadership in energy and Environmental Design) for green buildings, performs an integral evaluation of the building design considering the transportation and location to access; energetic consumption, construction materials, innovation, internal ambient quality, and how it promotes human health.

Obesity and overweight are global problems, and the diseases represent 5% of all the deaths worldwide (World Recommendations about Physical Activities for Health, 2010) Mexico is the second country with obesity in the world, almost 52% of population, 60.6 million people with overweight and obesity (Instituto Mexicano para la Competitividad, 2015) contribute to more than 68 thousand deaths annually. (González-Pier E, 2007) Every six years the Centre of Investigation in Nutrition & Health, according to with the Mexican Institute of Public Health, registers the incidence of obesity and overweight cases in Mexican population; the number of cases has increased through time, mainly in people of 20 or more years old (Graphic 1), nowadays these are severe issues in terms of public health in Mexico, causing diseases related to the metabolic syndrome: heart diseases, Diabetes Mellitus, and tumours, represent the highest mortality rate causes in the country (Graphic 2). Considering only the expenses related to diabetes, Mexico has invested between 82 and 98
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millions of pesos (4.72409 U.S. dollars), annually, which is equivalent to 73-87% of the money destined to public health in 2012.

**Graphic 1:** Overweight and obesity in less than 5 years old children, scholars (5-10 years old), adolescents (12-19 years old), woman (20-49 years old) and adults (>19 years old) from 1998 to 2012 (Mexican Institute of Public Health, 2012)

One of the main reasons for the obesity and overweight in population, is the excessive amount of energetic ingest combined with the low energy consumption (Rivera-Dommarco, 2013).

**Graphic 2:** Main causes of general morbidity in Mexico, 2012 (% total deaths) (INEGI, 2012)
A clear example is the year 2012, in which the physical activity was underneath the recommendations proposed by the WHO, where the 41% of the adolescents and 29.3% of adults were moderately active or inactive. In the past years, obesity was considered a disease that affected privileged social groups exclusively, this was truth for first world countries; nevertheless, those rates are different in countries like Mexico (or any country in development) where the relationship between the socioeconomic level and obesity is inverted therefore the poorest people of these countries show increased rates of obesity (Rivera-Dommarco, 2013) nowadays, undernourished and obese people can coexist in the same family. (Neufeld, 2006).

For the development of this research work, an analysis of the principal causes of obesity in Mexico was made, in which design can play a fundamental role, starting from the sedentarism problem understood as the lack of physical activity (PA), the relevance of this problem is based on epidemiologic data provided by the WHO, stating that the lack of PA is the 4th risk factor that causes more deaths worldwide (3.2 million per year).

The sedentarism and design have developed a relationship through time, one of the principal objectives of design is to make life easier, simplify and optimize work, and create new tools, methods and ideas to achieve it; transforming every common activity, diminishing the necessary effort and making people unconscious of this statement. Pitifully, years of design development have promoted the origin of an illness present in 30% of the worldwide population (Marie Ng, 2014) therefore, increasing the PA is considered a social need, not only an individual task, demanding a demographic, multidisciplinary and cultural perspective. Quoting Rem Koolhaas, a famous architect in an interview for “El Pais” while being asked what he considers overrated in society:

“...When I worked in Venice Bienal, I studied what was behind the architectonic changes. Almost every reason was commercial. But the argument always was the same, to achieve great comfort. Then I saw that comfort, and the obsession with security was turning into the dominant values of our society” (Koolhaas, 2016).

In table 1, different examples of situations and contexts in which a person can develop are shown involving decisions of behaviour choices that would define someone as a sedentary or a physically active person; if we observe the side of physically active people, not all the activities are strenuous, but those activities involve corporal movement. No matter if people is at work, home, school, or another context a behavioural decision can be made to be physically active. On the other hand, sedentary is related to tasks involving objects, that were produced by a designer, to perform activities such as watching TV, play videogames, do the laundry with a machine, travel in a car, among others.

| Context     | Behaviour Settings | Functions          | Behaviour Choices                      |
|-------------|--------------------|--------------------|----------------------------------------|
| Community   | Public spaces,     | Recreation /      | Walking, jogging, participating in     |
|             |                    | Socializing       | Sitting and socializing, TV viewing,   |

Table 1: Potential influences on behaviour setting and their functions on examples of physical active and sedentary choices.
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| Environment          | Activities                                                                 |
|----------------------|-----------------------------------------------------------------------------|
| Sport facilities     | sports, using exercise equipment, walking groups                           |
| Retail facilities    | spectating, eating/dining, reading, computer use, video games.              |
| Social settings      | Organized recreational programs                                             |
|                      | Walking groups, exercise classes                                             |
|                      | Reading groups, craft classes                                                |
| Home                 | Indoor, Outdoor                                                             |
|                      | Chores / Recreation                                                         |
|                      | Vacuuming, heavy cleaning, heavy yard work, home-based exercise             |
|                      | Dishwashing, ironing, use of labour service devices, sitting, lying down.   |
| Occupational         | Office Based                                                                 |
|                      | Production, cleaning                                                       |
|                      | Walking, stair use                                                          |
|                      | e-Commerce, elevator use                                                    |
|                      | Communication, service                                                      |
|                      | Walking to colleagues workspace                                             |
|                      | E-mail, telephone                                                           |
| Educational          | School, Tertiary education                                                  |
|                      | Incidental activities                                                       |
|                      | Walking, stair use                                                          |
|                      | Elevator use, sitting                                                       |
|                      | Extracurricular activities                                                  |
|                      | Extracurricular sports                                                      |
|                      | Computer and internet use, inactive, relaxing and socializing.              |
| Transport            | Roads, Walking and Cycling paths, Subways                                  |
|                      | Connecting                                                                  |
|                      | Walking, cycling                                                            |
|                      | Car driving, public transport                                               |

Own elaboration with information from (Owen N, 2000)

After doing this research we propose to guide design to revert this situation, gathering a list of researches and cases in which environmental design has promoted PA. According to Active Design Guidelines, there are three basic principles for environmental design to achieve helping a community: it must be inclusive, sustainable and active; including those principles, we will live in a society full of healthy and diverse population.
Active design is understood as a discipline that fosters human health through interventions in: children’s play areas, public plazas, grocery stores and fresh produce access, street connectivity, pedestrian pathways, traffic calming, streetscapes, bicycle networks, ways and infrastructure (City of New York, 2010) to promote active living, which is more than just physical fitness or exercise. It means making PA a part of daily living. (Bernard C.K. Choi, 2007)

Active cities are an investment in developing greater human, economic, social and environmental capital. Graphic 3 shows the principal benefits of the promotion of active cities according to “The Active Cities report” (Nike Inc., 2015)
2. Methodology

For the measure of the effectiveness of environmental design as a promoter of PA, a selection of projects was done, with samples that prove to have a documented positive effect for the promotion of PA in the community where the design intervention was applied. A filter of projects was done contemplating the countries with similar index of overweight and obesity as Mexico, according to WHO, Mexico have a prevalence of 64% of overweight and 28.1% of obesity (Obesity, 2014) Table 2 and 3, as well as projects that were implemented in countries with similar levels of development according to the OCDE report Table 4. (Schwab, 2015)

Table 2: Countries with similar overweight index as Mexico. The countries considered have a maximum difference of 3% than Mexico in the prevalence of the syndrome

| Andorra   | Canada   | Iran     | Oman  |
|-----------|----------|----------|-------|
| Argentina | Chile    | Jordan   | Panama|
| Australia | Czech Republic | Malta   | Tunisia|
| Barbados  | Egypt    | Mexico 64.4% | UK    |
| Belarus   | Israel   | New Zealand | USA   |

| Andorra   | Czech Republic | Ireland | Mexico 28.1% | Saint Kitts & Nevis | Suriname |
|-----------|----------------|---------|--------------|---------------------|----------|
| Argentina | Dominica       | Israel  | New Zealand  | Saint Lucia         | Tunisia  |
| Australia | Egypt          | Jamaica | Panama       | Seychelles          | Turkey   |
| Chile     | Grenada        | Lithuania | Papua New Guinea | Solomon Islands | UK      |
| Cuba      | Iran           | Malta   | Poland       | South Africa        | Uruguay  |

*Own elaboration with data from (Obesity, 2014)*

Table 4: The countries considered have a maximum difference of 15 places in the OCDE rank position.

| Kazakhstan 42 | Panama 50 | Rwanda 58 | Georgia 66 |
|--------------|-----------|-----------|-------------|
| Italy 43     | Turkey 51 | Slovenia 59 | Slovak Republic 67 |
| Latvia 44    | Costa Rica 52 | Macedonia 60 | Sri Lanka 68 |
| Russia 45    | Romania 53 | Colombia 61 | Peru 69 |
| Mauritius 46 | Bulgaria 54 | Oman 62 | Montenegro 70 |
| Philippines 47 | India 55 | Hungary 63 | Botswana 71 |
| Malta 48     | Vietnam 56 | Jordan 64 | Morocco 72 |
| South Africa 49 | Mexico 57 | Cyprus 65 |             |

*Own elaboration with data taken from (Schwab, 2015)*
The pillars to evaluate each environmental design project were: innovation with the country of the application as a variable, innovation with the project as a variable, efficiency, expertise and an approximation of lost of calories of the user.

Innovation level (IL) scale was elaborated depending on the country where the intervention of environmental design was applied, IL measures the innovation that is considerate as the conception and implementation of significant changes in the product, process, marketing or organization with the objective to improve the results. (Organizacion de Cooperacion y Desarrollo Economico, 2005) also, innovation has been defined as the implementation of a new, significant and improved product or service, process, strategy or method (Gamín, 1998). The IL measure is accomplished trough the social innovation model from Design Thinking that indicates that innovation is achieved if the product offered is fictile, affordable and desirable. Those levels were graduated as the following Table 5

The level of feasibility was measured considering the global competitiveness rank (GCR) of the country according to the OCDE report of the year when the intervention was applied, a score was given on a scale from 1 to 5, being 5 the highest, levels were determined as the following: 5 (GCR 1-28), 4 (GCR 29-56), 3 (GCR 57-84), 2 (GCR 85-112), 1 (GCR 113-140)

The level of affordance was measured considering the Macroeconomic Environment rank (MER) according to the OCDE report of the year, a score was given to a scale from 1 to 5, being 5 the highest, levels were determined as the following: 5 (MER 1-28), 4 (MER 29-56), 3 (MER 57-84), 2 (MER 85-112), 1 (MER 113-140)

The level of desirability was measured considering how necessary to apply the project was recognizing the percentages of obesity and overweight of the population where the project was developed according to the OMS, a scale between 1 to 3 was used, being 3 the highest percentage found; for obesity the rank was determined by the prevalence of existence in the country as the following: 3 (>29.9%), 2 (25%-29.9%), 1 (20%-24.9%). For overweight, the same scale was used but with the following criteria: 3 (>59.9%), 2 (40%-59.9%), 1 (20%-39.9%) IL scales the innovation through five different levels, resulting from the average of the affordance, feasibility and desirable factors.

Table 5: Innovation Country as a variable.

| Data                         | IL                      |
|------------------------------|-------------------------|
| Country                      | N/A                     |
| Year of application          | N/A                     |
| Economic environment         | Affordance:             |
| Global competitiveness       | Feasibility:            |
| % Overweight                 | Desirable:              |
To measure the innovation of each project the theory of (Davila T, 2006) (graphic 4) was used where depending on the technological advance and the business model employed the innovation is classified as incremental, where little modifications or improvements to the existing products were applied, semi-radical, where a technological knowledge, intellectual property, and technological changes are applied and radical innovation, where brand new products or processes are offered and consequently the creation of new markets emerges. (Davila T, 2006) A rank between 0 to 2 was used, 0 for incremental innovation, 1 for semi-radical innovation and 2 for radical innovation. (Table 6)

![Graphic 4](image)

*Own elaboration with recollected data from (N, 2016)*

| Innovation: Project | Technology (New=1,Similar=0) | Business Model (New=1,Similar=0) | Rank: |
|---------------------|------------------------------|---------------------------------|------|

For the definition of efficiency of each project, the material, human, economic, technological and energetic resources needed for the implementation were self-evaluated with a rank between 1 to 3, being 3 the most efficient if its level of consumption was low, 2 with moderate consumption and 1 with high consumption of resources (Table 7).
Table 7: Efficiency measurement. Own elaboration

| Efficiency | Resources | Low (3) | Moderated (2) | High (1) |
|------------|-----------|---------|---------------|---------|
| Materials  |           |         |               |         |
| Human      |           |         |               |         |
| Economic   |           |         |               |         |
| Technological |       |         |               |         |
| Energetic  |           |         |               |         |
| Total      |           |         |               |         |

Expertise was measured depending if the implementation was done by professional architects, urbanist, designers specialized in environmental or active design & if the project team was multidisciplinary or not (Table 8).

Table 8: Expertise measurement.

| Expertise                          | Professional members (Yes:1/No:0) | Multidisciplinary team (Yes:1/No:0) | Total |
|------------------------------------|-----------------------------------|-------------------------------------|-------|
|                                    |                                   |                                     |       |

The physical activation was evaluated using the Compendium of Physical Activities Tracking (Guide, 2000) developed to enhance the comparability of results across studies using reported PA and used to quantify the energy cost of a wide variety of PA. (Ainsworth BE1, 2011) With this tool the index of MET (Metabolic Equivalent of Task) was thrown. One MET is defined as 1 kcal/kg/hr and is equal to the energy cost of sitting quietly. (Bernard C.K. Choi, 2007) With this data a sum of MET was calculated from the average of the kind of activities that the user can do in the space. (Table 9)

Table 9: Physical Activity measurement

| MET          | Activity | Description | MET | Average |
|--------------|----------|-------------|-----|---------|
|              |          |             |     |         |

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3. Case Studies

Case 1: High Line. New York. USA.

Because of the growth of the truck industry, the last train ran through the High Line in 1980, it was until 1999 when “Friends of High Line” an association that collects foundlings for the park was founded to advocate for the High Line’s preservation and reuse as public open space. In 2009 the first section of the High Line park was opened to the public and since then it has been growing because of the positive response and support of the neighbourhood and visitors, actually, the High Line is 1.61 km length. (High Line, 2009)

| Innovation: Country as a variable | Data | IL |
|----------------------------------|------|----|
| **Country**                      | USA  | N/A|
| **Year of application**          | 2009 | N/A|
| **Economic environment**         | 96   | Affordance:2|
| **Global competitiveness**       | 3    | Feasibility: 5|
| **% Overweight**                 | 67.3%| Desirable: 3 / 2 = 1.5|
| **% Obesity**                    | 33.7%| Desirable: 3 / 2 = 1.5|
Innovation: 10

**Innovation: Project**

| Technology (New=1, Similar=0) | 0 |
|-------------------------------|---|
| Business Model (New=1, Similar=0) | 1 |

**Rank:** 1

### Efficiency

| Resources | Low (3) | Moderated (2) | High (1) |
|-----------|---------|---------------|----------|
| Materials | 2       |               |          |
| Human     | 2       |               |          |
| Economic  |         |               | 1        |
| Technological | 2   |               |          |
| Energetic | 3       |               |          |

**Total:** 10

### Expertise

| Professional members (Yes:1/No:0) | Multidisciplinary team (Yes:1/No:0) | Total |
|-----------------------------------|-------------------------------------|-------|
| 1                                 | 1                                   | 2     |

### Physical Activity Promotion Effectiveness

| Activity            | Description                        | MET  |
|---------------------|------------------------------------|------|
| Walk                | Walk for pleasure                  | 2.5  |
|                     | Walk 2 mph, slow pace, firm surface| 2.5  |
|                     | Walk 3 mph, moderate pace, firm surface| 3.3  |
|                     | Walk 4 mph, very brisk pace, firm surface| 5.0  |
|                     | Walk 4.5 mph, level, firm surface, very, very brisk| 6.3  |
|                     | Average                            | 3.92 |
| Volunteer activities| Walk/run play with children, moderate| 4.0  |
|                     | Walk/ stand position for volunteer purposes| 3.0  |
|                     | Average                            | 3.5  |
| Inactivity Light    | Reclining, reading                 | 1.0  |
|                     | Average                            | 1.0  |
| Running             | Jog/walk combination               | 6.0  |
|                     | Jogging general                    | 7.0  |
|                     | Average                            | 6.5  |
|                     | Total                              | 14.92|
Case 2: Linear Parks ("La Presidenta, La Bermejala, Bicentenario, La Hueso") Medellin City, Colombia.

Decades of crimes and corruption made a division between the rich and poor in Medellin City, (Nike Inc., 2015) as a new strategy the Mayor Sergio Fajardo (period 2004-2007) with the Environmental Secretary of Colombia designed and built several series of linear parks in the centre of the neighbourhoods with the purpose to serve as connectors between the orient and occidental zones. In some areas, those linear parks are the only public space available for the community. They also serve as a tool to preserve the ecosystem biodiversity and to control the pollution of the micro-basins. Pedestrian, mobility, and ecosystem were the main protagonists for this new vision. (Cuartas, 2012)

| Innovation: Country as a variable | Data | IL |
|-----------------------------------|------|----|
| **Country**                       | Colombia | N/A |
| **Year of application**           | 2009 | N/A |
| **Economic environment**          | 32   | Affordance: 4 |
| **Global competitiveness**        | 61   | Feasibility: 3 |
| **% Overweight**                  | 56.5%| Desirable: 2 / 2 = 1 |
| **% Obesity**                     | 21%  | Desirable: 1 / 2 = 0.5 |
| **Innovation**                    | 8.5  | Innovation: 8.5 |

| Innovation: Project |
|---------------------|
| **Technology** (New=1,Similar=0) | 0 |
| **Business Model** (New=1,Similar=0) | 1 |
| **Rank:** | 1 |

| Efficiency |
|------------|
| **Resources** |
| Low (3) | Moderated (2) | High (1) |
| **Materials** | 3 |
| **Human** | 2 |
| **Economic** | 3 |
| **Technological** | 2 |
| **Energetic** | 3 |
| **Total** | 13 |

| Expertise |
|-----------|
| **Professional members (Yes:1/No:0)** |
| Multidisciplinary team (Yes:1/No:0) | Total |
|                                  |      |
| Activity                | Description                                                                 | MET  |
|-------------------------|------------------------------------------------------------------------------|------|
| Walk                    | Walk for pleasure                                                           | 2.5  |
|                         | Walk 2 mph, slow pace, firm surface                                         | 2.5  |
|                         | Walk 3 mph, moderate pace, firm surface                                     | 3.3  |
|                         | Walk 4 mph, very brisk pace, firm surface                                   | 5.0  |
|                         | Walk 4.5 mph, level, firm surface, very, very brisk                         | 6.3  |
|                         | Average                                                                      | 3.92 |
| Volunteer activities    | Walk/run play with children, moderate                                       | 4.0  |
|                         | Walk/stand position for volunteer purposes                                  | 3.0  |
|                         | Average                                                                      | 3.5  |
| Inactivity Light        | Reclining, reading                                                           | 1.0  |
|                         | Average                                                                      | 1.0  |
| Running                 | Jog/walk combination                                                         | 6.0  |
|                         | Jogging general                                                             | 7.0  |
|                         | Average                                                                      | 6.5  |
| Bicycling               | Bicycling, <10 mph, leisure, to work or for pleasure                        | 4.0  |
|                         | Average                                                                      | 4.0  |
| Conditioning exercise   | Calisthenics (.e.g. Pushups, pull ups, jumping jacks), heavy, vigorous effort| 8.0  |
|                         | Calisthenics, light or moderate effort                                       | 3.5  |
|                         | Circuit training, including some aerobic movement with minimal rest          | 8.0  |
|                         | Stretching, yoga                                                            | 2.5  |
|                         | Average                                                                      | 5.5  |
| Sports                  | Children’s games (hopscotch, 4-square, dodge ball, playground apparatus, t-ball) | 5.0  |
|                         | Average                                                                      | 5.0  |
|                         | Total                                                                        | 29.41999 |
Case 3: Bicycle sharing schemes / EcoBici. Mexico City, Mexico.

Over 600 bicycle sharing schemes are operating around the world. Europe has the biggest percentage of existing programs with 63% and Africa and Australia on the other hand have less than 1% of the world bike share programs. According to the Bike Share 2014 report 40% of the users report driving less and for every mile, in a bike rather than in a car 82 pounds of Co2 are kept out of the atmosphere also it is reported that every user thinks of sharing bicycles seems as the funniest form of public transportation. (Factsheet, 2014)
EcoBici in the biggest sharing bicycle scheme in Mexico, it is a government program however the user must pay an annual fee for the service of $400 MXN (19.38 USD). In the EcoBici report from 2014, an online inquest was done (n=960) to know and measure their attributes and failures. 450 users indicated that their trips with EcoBici are 6 to 15 minutes length which represents the 50% of daily physical activity recommended by the OMS. In EcoBici 62% of the users are male, 34% uses the service 5 or more days a week and 47% of them are between 25 to 34 years old, 87% are employers and 48% use this service to travel from their houses to work, despite that for a lot of them the main purpose of their subscription to the program was to avoid vehicle traffic, 82% of them have noticed an increase in their well-being status reflected in different aspect such as relaxation, economic saving, increase of physical condition, increase of free time, etc (Graphic 6). The program also promotes walking, 37% of the trips made with EcoBici are complemented with 10+ minutes long walking.
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**Graphic 6: Changes that users have noticed in their lives after their EcoBici subscription**

| Changes                           | Percentage |
|-----------------------------------|------------|
| Other                             | 5%         |
| Weight loss                       | 10%        |
| Health increase                   | 15%        |
| Better mood                       | 25%        |
| Increase of free time             | 30%        |
| Better physical condition         | 35%        |
| Economic saving                   | 40%        |
| More relaxed                      | 45%        |

*Own elaboration with information from (López, 2014)*

**Innovation: Country as a variable**

|                        | Data | IL      |
|------------------------|------|---------|
| **Country**            | Mexico | N/A    |
| **Year of application**| 2007 | N/A    |
| **Economic environment** | 95 | Affordance:2 |
| **Global competitiveness** | 57 | Feasibility:3 |
| **% Overweight**        | 64.4% | Desirable: 3/2 = 1.5 |
| **% Obesity**           | 28.8% | Desirable: 2/1 = 2 |

**Innovation: Project**

|                        |   |
|------------------------|---|
| **Technology (New=1, Similar=0)** | 0 |
| **Business Model (New=1, Similar=0)** | 0 |
| **Rank**               | 0 |
**Efficiency**

| Resources     | Low (3) | Moderated (2) | High (1) |
|---------------|---------|---------------|----------|
| Materials     | 2       |               |          |
| Human         | 2       |               |          |
| Economic      | 2       |               |          |
| Technological | 2       |               |          |
| Energetic     | 3       |               |          |
| **Total**     |         |               | **11**   |

**Expertise**

| Professional members (Yes:1/No:0) | Multidisciplinary team (Yes:1/No:0) | Total |
|-----------------------------------|-------------------------------------|-------|
| 1                                 | 1                                   | 2     |

**Physical Activity Promotion Effectiveness**

| Activity      | Description                                           | MET |
|---------------|-------------------------------------------------------|-----|
| Walk          | Walk for pleasure                                     | 2.5 |
|               | Walk 2 mph, slow pace, firm surface                   | 2.5 |
|               | Walk 3 mph, moderate pace, firm surface               | 3.3 |
|               | **Average**                                           | 2.766|
| Bicycling     | Bicycling <10 mph, leisure, to work or for pleasure  | 4.0 |
|               | Bicycling general                                     | 8.0 |
|               | Bicycling 10-11.9 mph, leisure, light effort          | 6.0 |
|               | Bicycling 12-13.9 mph, leisure, moderate effort       | 8.0 |
|               | Bicycling 14-15.9 mph, racing or leisure, fast, vigorous effort | 10.0 |
|               | **Average**                                           | 7.2  |
|               | **Total**                                             | 9.966|

**Case 4: pasSPORT to Health Project, South Africa, Africa**

The project started in 2010 when students from the Nelson Mandela Metropolitan University intervened with three disadvantaged schools of the area. The students made research and obtained sponsorships and liaising with communities. After that, they implement standardized physical activity-friendly environments in partnership with teachers and community members from the schools. They made painted games and playground stations with low-cost materials which include several donations.
The project included a leadership camp for the prefectures where they were taught to play and use the playground areas, enable them to transfer this knowledge to the students.

Qualitative interviews were conducted to analyse the effectiveness of the interventions for the promotion of physical activity (n=79), a significant BMI difference of 1.81 was observed (t= -2.05, p = .043, d = .46, small). The results also show an increase of moderate to vigorous physical activity (MVPA) and a decrease of sedentary behaviour of children in 6 weeks after intervention.

*Graphic 7: Physical activity increase*

*Own elaboration with information from (Walter, 2010)*

**Innovation: Country as a variable**

| Data                | IL       |
|---------------------|----------|
| Country             | South Africa | N/A       |
| Year of application | 2010     | N/A       |
| Economic environment| Affordance: 2 |
| Global competitiveness| Feasibility: 4 |
| % Overweight        | Desirable: 2 / 2 = 1 |
| % Obesity           | Desirable: 2 / 2 = 1 |
Innovation: 8

Innovation: Project

| Technology (New=1,Similar=0) | 0 |
|------------------------------|---|
| Business Model (New=1,Similar=0) | 0 |
| Rank: | 0 |

Efficiency

| Resources | Low (3) | Moderated (2) | High (1) |
|-----------|---------|---------------|---------|
| Materials | 3       |               |         |
| Human     |         | 2             |         |
| Economic  |         | 3             |         |
| Technological | 2 |     | |
| Energetic |         | 3             |         |
| Total     |         |               | 13      |

Expertise

| Professional members (Yes:1/No:0) | Multidisciplinary team (Yes:1/No:0) | Total |
|-----------------------------------|-------------------------------------|-------|
| 0                                 | 1                                   | 1     |

Physical Activity Promotion Effectiveness

| Activity               | Description                                                                 | MET |
|------------------------|-----------------------------------------------------------------------------|-----|
| Occupation             | Teach physical education, exercise, sport classes (non-sport play)          | 4.0 |
|                        | Teach physical education, exercise, sport classes (participate in class)    | 6.0 |
|                        | Average                                                                      | 5.0 |
| Sports                 | Children’s games (hopscotch, 4-square, dodge ball, playground apparatus, t-ball) | 5.0 |
|                        | Average                                                                      | 5.0 |
| Volunteer activities   | Walk/run play with children, moderate                                       | 4.0 |
|                        | Walk/run play with children, vigorous                                        | 5.0 |
|                        | Walk/stand position for volunteer purposes                                   | 3.0 |
|                        | Average                                                                      | 4.0 |
|                        | Total                                                                        | 14  |
4. Results

Case 1: High Line
Innovation: Country as a variable

Case 2: Linear Parks
Innovation: Country as a variable
Figure 10. Results.
For future studies, with the MET data, specific number of calories lost can be estimated (Kcal/min= MET * 0,0175 * weight (kg)). (Pardon, 2014) Currently because of the lack of information about the weight of the users the estimation couldn’t be accomplished.

After the analysis, a differentiation between the nature of the different cases was observed, this variation depends on the main reason which conducted the creators to implement the project, three principal reasons were recognized with which a classification was divided as Social Driven, if they were purely designed for the society benefit, Economical Driven, if they were necessary for a community but an economical retribution was expected.

| CLASSIFICATION |   |
|----------------|---|
| Social Driven  | Economical Driven |
| High Line Park | ECO BICI            |
| Linear Parks   |                 |
| PasSPORT       |                 |

**5. Conclusion:**

With low resources, environmental designers have accomplished the physical activation of a small community. A promotion of Active Design should be spread between urban designers, environmental designers, architects, interior designers and decisions makers. Nowadays the active design trend is growing and we live in a critical status where designers must make aware the importance of the sedentary problem with their work so government and international institutes decide to join to this model. In the specific case of Mexico where very low indexes of PA are registered, an identification of the lack of public spaces conditioned for PA and the necessity of the prioritization of investments oriented to active public transport and incentives for PA in labour context are remarked. (Instituto Mexicano para la Competitividad, 2015).
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