The role of botanic gardens in health and well being

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Abstract
This paper is based on a literature review carried out on the therapeutic qualities on human health of green spaces within the urban environment. The themes are: 1. The benefits of accessible green space with regards to general health and well being, stress management, recovery from illness, quality of life and longevity. 2. The cost benefits to the community in the provision of green spaces and the need for collaboration between urban planners, green space providers, health administrators. 3. The importance of these landscapes in the developmental stages of children.

Within the context of this paper the term “green spaces” covers an extensive range of situations and opportunities from which people can achieve both short and long term health benefits through the accessing of nature. It includes natural settings, public park systems, public and private gardens among others. This paper focuses on the derived health benefits that people living in a highly urbanised setting can gain through having access to publicly owned/controlled “green spaces”.

The paper briefly discusses the three main theories linking health with the natural environment; the biophilia theory (Wilson, 1984), attention restorative theory (Kaplan, 1995), and the Psycho – physiological Stress Recovery Theory (Ulrich, 1983). Summaries of the three theories can be found in Marshall *et.al.* 2010 (pp. 2/3).

Keywords

Botanic Gardens, green Infrastructure, health, wellbeing

Report

The City of Dubbo is located at the geographical centre of New South Wales state and borders four major bioregions: the Brigalow South, the South West Slopes, the Cobar Penneplain and the Hunter section of the Sydney basin. In recognition of our unique opportunity to display species from these four neighbouring bioregions, as well as providing a new recreational and educational facility for the residents and visitors to the City, Dubbo City Council commenced the development of a master plan for a botanic garden in 1997. In April of the following year Council adopted the Elizabeth Park Master Plan that set the stage for the development of the Dubbo Regional Botanic Garden at the 10 hectare site in East Dubbo.

Development commenced in 1999 with the planting of an avenue of *Populus yunnanensis* as part of the 150th anniversary of Dubbo being proclaimed a village. The first of the major garden elements Shoyoen, the Japanese garden, was formally opened in 2002. This garden was a gift by Dubbo’s sister city Minokamo to the people of Dubbo. The attention to detail and the authenticity in maintaining this garden is reinforced through an annual visit by gardeners from Minokamo and results in Shoyoen being recognised as one of the best examples of a “strolling and refreshing garden” in Australia.

In keeping with the original intent of the master plan to display and promote the endemic vegetation found within the Dubbo area the next garden to be developed and opened to the public was the Biodiversity Garden in June 2006. This garden replicates the major vegetation communities of the Dubbo region that include: Grassy Box Woodlands, Ironbark and Redgum forests, rocky creeklines and wetlands.

The Sensory Garden followed in 2011 and provides the public a garden that stimulates the five senses through the landscaping and the choice of plants displayed. The newest garden, the Oasis

Valley opened in April 2013, again returns to the objective of providing a collection of plants that are found within one of the four bioregions. Within the Oasis Valley there is a collection of "dry rainforest" species which reflect the dry rainforest community of the northern Hunter Valley region.

Figure 1. Dubbo Regional botanic garden master plan and gardens

Although Elizabeth Park is being established with the intent to create a botanic garden and provide opportunities for scientific research and education, botanic gardens can play another significant role within their communities. This role is one of a "health provider" which it can achieve through the provision of spaces within the confines of the botanic garden for promoting physical activity that can help reduce the incidence of a range of diseases and medical conditions within our communities. Studies have shown that the simple activity of walking can:

- improve general health, reduce the risk of coronary heart disease by 14% and reduce the risk of cardiovascular disease by 25% (Willis and Crabtree 2011).

- Reduce the incidence of Type 2 diabetes, some cancers and osteoporosis and improve mental health and mood (Coutts, 2010).

To help illustrate the extent of the problem and the opportunities that it provides, botanic gardens and other recreational providers should consider the following statistics:

- 61% of the Australian population is overweight or obese. 25% of children aged between 5–17 years are overweight or obese (NSW Dept. of Health, 2008). However girls and boys living near accessible green space were, on average, 5.1kg and 5.9kg lighter than those living in a more urbanised setting (Bird, 2011). Another study (Ellaway, Macintyre & Bonnefoy, 2005), also found that increasing levels of accessible green space led to increasing levels of physical activity that resulted in a lower incidence of obesity (Table 1)

- In Australia, 1,086,860 people are registered as having diabetes, with 937,480 people having Type 2 diabetes (NDSS, 2013); this costs the economy $10.3 billion annually. Type 2 diabetes is recognised as Australia's fastest-growing chronic disease, with over 200 cases registered per day. However up to 60% of Type 2 diabetes cases are reportedly preventable through increased physical activity and improved diet.

- In Australia over 3 million people suffer from depression-related illnesses, that costs the economy $3.3 billion annually in lost productivity (Beyond Blue 2005).

There is also an increasing amount of evidence for the benefits of green spaces to children suffering from Attention–Deficit /Hyperactivity Disorder (ADD/ADHD) and their potential for utilising nature-based restorative therapy as a non-medicating and inexpensive treatment for children

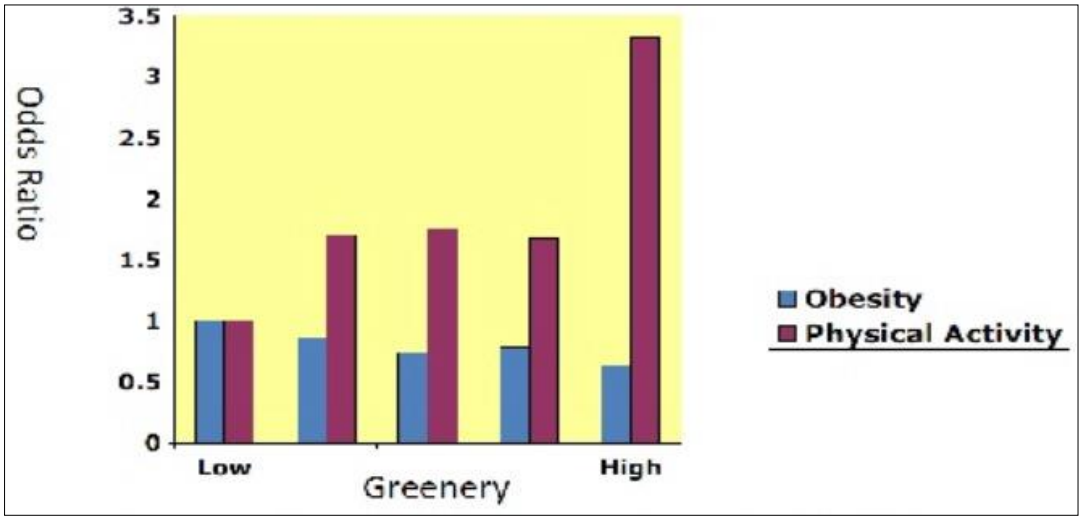

Figure 2. Relationship between the level of greenery, physical activity and obesity. (Ellaway, Macintyre and Bonnefoy 2005)

suffering from ADD/ADHD (attention deficit disorder). Results from studies carried out (Faber Taylor, Kuo & Sullivan 2001 (p.73), and Kuo & Faber Taylor 2004 (p.1584)) found that children suffering from ADD or ADHD who undertook nature-based activities exhibited reduced ADD symptoms by up to 30% compared to urban outdoor activities (p.65), and also a three fold reduction in symptoms where the same nature-based activity was carried out indoors (Bird 2007 (p78)).
The positive relationship between the improved behaviour of children with ADHD undertaking nature-based activities, compared to indoor activities or activities within an outdoor built environment, is shown in Figure 3.

When you consider that most botanic gardens are well designed and laid out with a system of paths, trails etc, and are well embellished with plants and developed landscapes, then there is an opportunity for botanic gardens to develop collaborative partnerships with formal health providers and urban planners to deliver positive health outcomes to the community, while still meeting the fundamental criteria of a botanic garden. While these benefits may not translate directly into an additional income stream for the botanic garden itself, these benefits and cost savings may express themselves throughout the community in terms of a general improvement in health and cost savings in a tax funded health system.

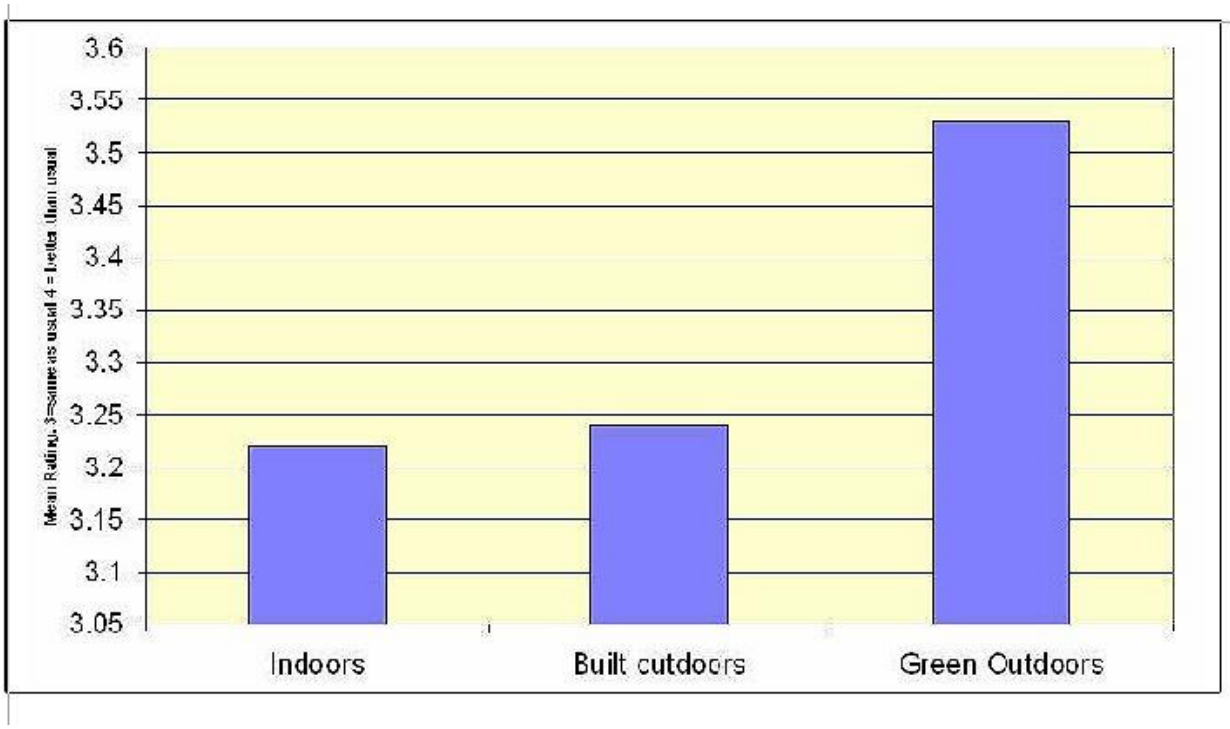

Figure 3. Relationship between ADHD symptoms and playing indoors, in the built environment or in green space (Bird, 2011)

Figure 4. Proposed path network for the Dubbo Regional Botanic Garden

Upon completion the Dubbo Regional Botanic Garden will have over 8 km of trails to provide pedestrian access throughout the Garden, as shown in Figure 4, with 2.5 km already constructed.

While these paths provide the opportunity for physical activity within the garden, they also connect to a much broader park concept for the City of Dubbo – the City Wide Park, seen in Figure 5 below.

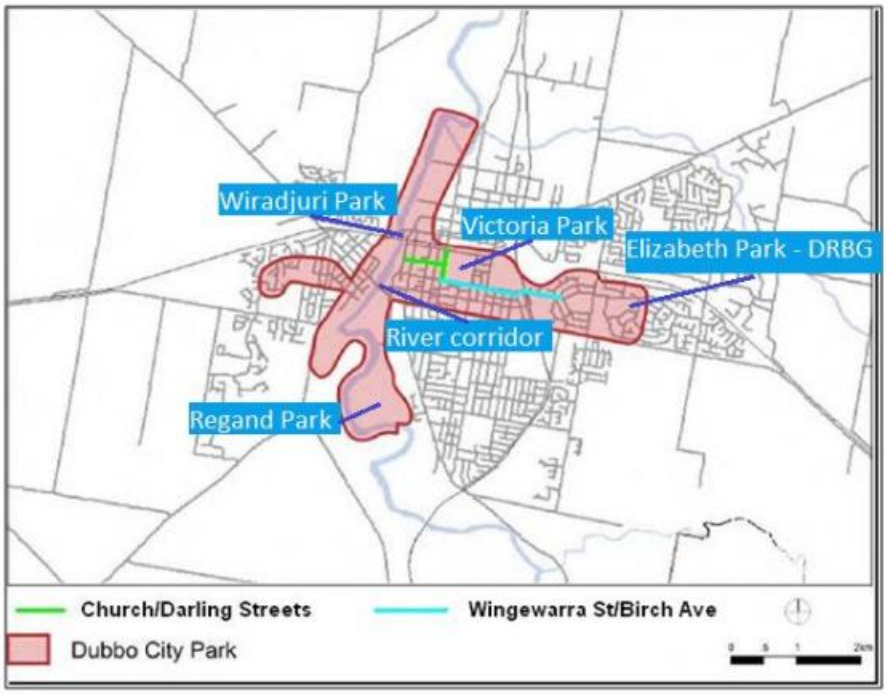

Figure 5. Future extent of Dubbo's City Wide Park

The City Wide Park already contains a large area of recreational land that includes parks, sporting facilities and reserves. As a result of good long-term planning by Dubbo City Council, much of this green space is concentrated along the river corridor. However the further you move away from this corridor the public open space becomes increasingly fragmented within the urban fabric of the city. To help re-establish the connectivity of the public open space, the City Wide Park plans to utilise this "green spine" and re-connect it to other major parks through a network of "park streets", pedestrian and cycle ways. These parks include the Dubbo Regional Botanic Garden, Victoria Park (the oldest park in Dubbo dating back to 1876 and home to a wonderful collection of Victorian-era plants), Regand Park and Wiradjuri Park. While neither Regand Park nor Wiradjuri Park are yet developed, they will both make a significant enhancement to the recreational facilities of Dubbo.

Both Regand and Wiradjuri Parks have been designed with a high level of consultation with the community; they have very different goals and objectives. Regand Park is a 62 ha park located on the Macquarie River. Figure 6 below shows parkland features that have been designed largely around passive (walking trails) and active recreational pursuits (running, sport, bike riding, horse riding, swimming etc) to provide opportunities for the residents of Dubbo to increase their level of physical activity. There is also a strong focus on the rehabilitation and restoration of the riverine vegetation. This too provides the opportunity to encourage people to "get physical" through community planting days that develop community ownership of the Park.

In contrast, Wiradjuri Park is a much smaller park of 3.5 ha. Through a community consultation process, this park has been designed as an Aboriginal cultural park and a place for quiet contemplation. It is a place where the Aboriginal community can both celebrate their culture, a space to sit quietly and reflect, and a place to acknowledge significant dates on the Aboriginal calendar.

Figure 6. Master plan for Regand Park showing the extent of recreational facilities on offer.

Figure 7 Wiradjuri Park – contemplative space

An important feature of the City Wide Park is the increased connectivity of the public open space through “park streets”. These are streets which retain their functionality as a vehicular carriageway but are significantly embellished with park-like qualities that include plants, footpaths, cycleways, street furniture etc. The purpose of these park streets is to allow people to move between different parcels of parkland through an aesthetically pleasing setting rather than the traditional urban setting seen in figure 8.

Figure 8. The development of Brisbane Street into a 'park street'. Before and after Phase 1 of the central planting of *Angophora floribunda* in the median, completed June 2013

Through the development of the City Wide Park in conjunction with the Dubbo Regional Botanic Garden, the City will possess over 30 km of connected footpaths and cycleways with still more to be developed.

The Dubbo Regional Botanic Garden provides a range of other opportunities and spaces that can help:

- Encourage the community to participate in exercise and social interaction. These programs cover a wide range of opportunities that include:
- Educational programs that link into the National Curriculum that involve children moving, exploring and interpreting their environment,
- Community planting days to help with the ongoing development of the Garden, and
- One on One learning opportunities.
- Children gardening programmes that, according to Wake 2006, can provide the following benefits:

  - Inspire learning about plants
  - Provide ownership and belonging to a child-centered space
  - Multidisciplinary learning in arts, sciences, social skills etc.
  - Foster the appreciation of gardens and the outdoors
  - Create positive memories that may lead to a sense of earth stewardship that they can then take into adulthood.

- Improve social inclusiveness and recovery from injury through occupation therapy spaces. These programs can also be are tailored to meet the needs of:

  - Elderly or less mobile persons, and
  - Disabled persons.

Figure 9. Opportunities for helping to increase physical activity through the Dubbo Regional Botanic Garden

These gardening programmes have proven to be successful for a number of reasons, including the design and construction of the potting bench that enables access to both electric and standard wheelchairs for both adults and children, as well as the choice of plant material used. The cultivation of succulents has proven to be extremely successful, because of to their large fleshy leaves and their ability to withstand damage but still take root.

Summary

While the role of botanic gardens will always be based on their scientific and education utility, there is also an opportunity for them to collaborate with town planners, councils and health providers to help promote a healthier lifestyle. In recognising that the influence of the botanic garden does not necessarily stop at the front gate but can be effective throughout the urban environment, not only can the botanic garden benefit through increased patronage and community assistance in future development, but the entire community can also achieve a higher level of fitness and mental well being that can reduce the incidence of a number of diseases and conditions that are becoming more common within our society.

> *An experience of nature can help strengthen the activities of the right hemisphere of the brain, and restore harmony to the functions of a brain as a whole. Furnas 1979.*
>
> *"This is a technical explanation of the process that occurs when people "clear their head" by going for a walk in a natural setting". Maller et. al 2005*

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