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The effects of changes to the built environment on the mental health and well-being of adults: Systematic review

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ABSTRACT

There is increasing interest in the influence of place on health, and the need to distinguish between environmental and individual level factors. For environmental-level factors, current evidence tends to show associations through cross-sectional and uncontrolled longitudinal analyses rather than through more robust study designs that can provide stronger causal evidence. We restricted this systematic review to randomised (or cluster) randomised controlled trials and controlled before-and-after studies of changes to the built environment. Date of search was December 2016. We identified 14 studies. No evidence was found of an effect on mental health from ‘urban regeneration’ and ‘improving green infrastructure’ studies. Beneficial effects on quality-of-life outcomes from ‘improving green infrastructure’ were found in two studies. One ‘improving green infrastructure’ study reported an improvement in social isolation. Risk-of-bias assessment indicated robust data from only four studies. Overall, evidence for the impact of built environment interventions on mental health and quality-of-life is weak. Future research requires more robust study designs and interdisciplinary research involving public health, planning and urban design experts.

1. Background

Mental health and well-being are important public health issues. In 2010, mental health disorders accounted for 56.7% of 258 million global disability-adjusted life years (DALYs) (Whiteford et al., 2015). In the United Kingdom (UK) mental health problems are the greatest cause of disability (Mental Health Taskforce, 2016) and, although trends in self-reported personal well-being are improving, mental health continues to deteriorate (Office for National Statistics, 2017a). Promoting health and well-being is a World Health Organization (WHO) Sustainable Development Goal for 2030 (United Nations, 2015) and WHO’s Comprehensive Mental Health Action Plan calls for a “multi-sectorial approach” to protect mental health and prevent mental health problems (World Health Organization, 2013).

There is increasing interest in the influence of place on health, and the need to distinguish between contributions of “contextual” (environmental level) and “compositional” (individual level) factors to area level health differences has been argued (Macintyre et al., 2002).

The Scottish Government Health Inequalities Task Force also recognise the importance of environment on health and well-being (Scottish Government, 2008). Several systematic reviews highlight associations between environment and mental health and well-being (Won et al., 2016; Mair et al., 2008; Paczkowski and Galea, 2010; van den Berg et al., 2015; Lee and Maheswaran, 2011; Lavin et al., 2006; Gong et al., 2016; Croucher et al., 2007). However, evidence varies in quality and has tended to show associations through cross-sectional and uncontrolled longitudinal analyses rather than establishing causal effects through the use of randomized controlled trials (Barton et al., 2010; Bond et al., 2012; Ellaway et al., 2005; Guite et al., 2006; Horowitz et al., 2005; Stafford et al., 2007; White et al., 2013; Whitley and Prince, 2005; Wu et al., 2015). Cross-sectional analyses have the limitation that there is ambiguous temporal precedence (i.e. it is unclear which variable is the cause and which is the effect), and longitudinal studies without a control group do not allow the possibility to distinguish between effects of the intervention from effects due to events that occur concurrently with the intervention, naturally occurring changes

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over time, or regression to the mean if the intervention group has been chosen due to extreme values (i.e. poor baseline mental health). Quasi-experimental studies, such as controlled before-after studies, if well-designed and performed, can reduce the risk of some of these barriers to interpretation. There is often no control for confounders such as healthier people choosing to live in neighbourhoods that support their mental health. Understanding these associations is impeded by: use of different measures of mental health, well-being and environmental domains; presence of mediators and moderators; and interactions between physical and mental health and well-being outcomes (Lachowycz and Jones, 2011).

Studies have indicated the following: neighbourhood aesthetic quality is positively associated with higher mental well-being (Bond et al., 2012); quality and accessibility of local environments in terms of availability of public transport, access to seating, attractiveness of the neighbourhood, and access to green space are key factors in improving use of the local neighbourhood by older adults (Stathi et al., 2012), and; risk of injury from traffic and disrepair of the built environment in low-income areas may adversely affect mental health (Lavin et al., 2006; Croucher et al., 2007; Ellaway et al., 2005; Horowitz et al., 2005; Stafford et al., 2007; Whitley and Prince, 2005).

Objective measures of urban environments (including neighbourhood quality, quantity of green space and land-use mix) have been associated with psychological distress (Gong et al., 2016). Similarly, objective measures of greenspace in living or home environments have been positively associated with perceived mental health (van den Berg et al., 2015; White et al., 2013) and negatively associated with depression and anxiety symptoms (Wu et al., 2015). However, Lee and Maheswaran (2011) concluded there is weak evidence for associations between mental health and well-being and urban green space, highlighting weak study designs in the literature.

Examining effects of modifications to the environment on mental health and well-being is complex and limited by methodological challenges associated with quasi-experimental evaluation. For instance, it is often challenging to define exposure to population level interventions and to identify an unexposed group (Egan et al., 2003; Ogilvie et al., 2010; Humphreys et al., 2016).

Most research and guidance to date has focused on relationships between the built environment and physical health rather than mental health and well-being (Egan et al., 2003; Bunn et al., 2003; Burns et al., 2014; Cerda et al., 2013; NICE, 2008; Tully Mark et al., 2013; World Health Organization, 2006). A systematic review of intervention studies examining effects of changes to the built environment on the health of children and young people found some evidence of potential benefits to physical activity but was unable to find any mental health and well-being outcomes in the literature (Audrey and Batista-Ferrer, 2015).

Responses to changes to the built environment to support health are likely to vary across the life-course (Villanueva et al., 2013). Worldwide, populations are ageing (World Health Organization, 2018) and in the UK specifically, the proportion of the population over 65 years is increasing (Office for National Statistics, 2017b) hence it is important to consider how changes to the built environment influence the mental health and well-being of adults and older adults. Furthermore, given exposure to green space is associated with fewer mental health disorders in older adults, it has been suggested planners should consider ways to encourage this group to use green space to support healthy ageing (Wu et al., 2015).

We found no systematic review evidence for intervention studies investigating effects of changes to the built environment on mental health and well-being in adults and older adults. This evidence is needed to inform recommendations to support policy decision making. The aim of this systematic review is to assess the evidence of changes to the built environment on mental health, well-being, quality of life, social inclusion and fear of crime in adults living in urban environments in high income countries.

2. Methods

A protocol with details of our planned research methods is registered with PROSPERO (Moore et al., 2015) and we reported the review according to PRISMA guidelines (Moher et al., 2009).

2.1. Search strategy

We searched using subject and text word terms for built environment (e.g. urban, built etc), intervention types (e.g. road safety, traffic calming, environment design, urban renewal etc) and terms describing mental health and well-being (e.g. wellness, quality of life, anxiety, stress etc). We focussed on adults and older adults as a recent review summarising effects of changes to the built environment on children and young people had been completed (Audrey and Batista-Ferrer, 2015). We restricted our search to studies published in English and excluded letters, editorials, and conference proceedings.

We searched 13 electronic bibliographic databases MEDLINE, PreMEDLINE, Embase and PsycINFO on OVID; Cochrane CENTRAL on The Cochrane Library; Core Collection on Web of Science; Database of Promoting Health Effectiveness Reviews (DOPHER); Trials Register of Promoting Health Interventions (TROPHI); Transport Research International Documentation (TRID) from US National Academies of Sciences, Engineering and Medicine; Health Evidence from McMaster University Canada; GreenFILE on EBSCO; Health Management Information Consortium (HMIC); GeoBASE on Elsevier and Planex. All databases were searched from inception to December 2016. We searched for grey literature and additional reports of research using Google, WHO trials registry, Clinical trials.gov, ISRCTN registry, OpenGrey, NHS Evidence, plus websites of 33 associations, charities, cities etc. (See [Supplementary material](#) for details of search terms used).

2.2. Inclusion criteria

We restricted study selection to randomized controlled trials (RCTs), cluster RCTs, controlled before-and-after studies, interrupted time series and regression discontinuity studies assessing the effects of any physical change to the built environment on adult or older adult mental health and well-being, quality of life, social inclusion or isolation, social capital, isolation or fear of crime.

We excluded studies in rural environments or low- or middle-income countries. It is expected that context specific factors are likely to influence the relationship between the built environment and mental health and well-being in these settings which would make drawing comparisons to high-income countries difficult. This approach is in line with previous research (Won et al., 2016; Lee and Maheswaran, 2011). Studies reporting introduction or upgrading of street lighting or closed circuit or surveillance cameras (CCTV) were excluded as these had recently been reviewed comprehensively (Lorenc, 2014). We excluded studies where changes were applied to environments not accessible to everyone or inside buildings (e.g. private grounds, schools, hospitals) as our interest was in the public realm. Studies where the main or sole intervention was either relocation from one area to another or improvement or refurbishment to the housing stock were also excluded.

2.3. Study selection, data extraction and analysis

We screened titles and abstracts and eligibility of full-text reports independently and in duplicate (TM, SI, JK, SA, SG). Data were extracted by one author and recorded on a predefined and piloted data extraction form and a second author checked extracted data (TM, JK, SI, AM, JLL). Extraction of numerical results and risk of bias assessments for each study were done by two reviewers independently (TM, SI, JK, AM, JLL). Any discrepancies in screening or data extraction were discussed until consensus was reached, with recourse to a third reviewer if required.

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