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Kramer, D.

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CHAPTER 8

Uncovering how area-based initiatives may stimulate leisure-time walking among adults in deprived areas: a realist review

D Kramer
J Lakerveld
K Stronks
AE Kunst

Submitted for publication

ABSTRACT

Background Numerous area-based initiatives (ABIs) have been implemented in deprived areas across Western-Europe with the aim to improve the living conditions of its inhabitants. There is evidence that these initiatives can stimulate leisure-time walking (LTW), but underlying pathways remain unclear. This study aimed to explore how ABIs might enhance LTW in deprived areas.

Methods Realist review methodology was applied. First, we developed an initial programme theory explaining how ABIs may be expected to enhance LTW. This initial theory was tested and refined using evidence from the peer-reviewed literature. We searched three electronic databases for evidence on how LTW in deprived areas is influenced by the neighbourhood environment or related interventions.

Results A synthesis of thirteen studies revealed three main pathways by which ABIs may stimulate LTW in deprived areas. First, all studies indicated that less safety problems and better physical neighbourhood design may reduce the fear to use existing LTW facilities (e.g. parks, sidewalks). Second, seven studies indicated that better neighbourhood aesthetics might make LTW facilities more relaxing and stress releasing. Third, seven studies indicated that better infrastructure might make existing LTW facilities more convenient. Three additional, less well supported pathways were identified. First, two studies indicated that more LTW facilities might create more settings for LTW. Second, two studies indicated that more social capital might improve social support for LTW. Third, two studies indicated that more social capital might increase social interaction while walking.

Conclusions This realist review indicates that ABIs might stimulate adult LTW in deprived areas primarily by making existing LTW facilities less frightening, more relaxing, and more convenient.

Keywords walking, neighbourhood, area deprivation, area-based initiative, realist review

INTRODUCTION

Despite the well-known health benefits of physical activity (PA), 34.8 % of the European adult population do not meet recommended levels of PA [1]. These numbers are even higher in deprived areas as compared to non-deprived areas, especially when it comes to PA in leisure time [2-4]. These area differences in PA can only partly be explained by differences in individual characteristics [2-4]. Ecological models posit that PA is determined by the interaction of an individual with its environment [5-8]. Several reviews have pointed to associations of PA with various physical and social neighbourhood characteristics including aesthetics, infrastructure, recreational facilities, and social networks [9-13]. Compared to adults in non-deprived areas, those living in deprived areas generally perceive poorer neighbourhood aesthetics, less public recreational facilities, less social support, more safety problems, and lower levels of trust and social cohesion [2,14-16]. These results imply that area differences in adult PA can potentially be explained by poorer neighbourhood conditions.

In the past decade, numerous area-based initiatives (ABIs) have been implemented in deprived areas across Western-Europe with the aim to improve the socio-economic position of its residents as well as their living conditions [17]. As such, ABIs have the potential to reduce area-based PA inequalities. Only few ABIs have been evaluated for their impact on PA, and resulting evidence is conflicting. In 1998, the New Deal for Communities was introduced in the 39 most deprived areas of England. A wide array of interventions was implemented to tackle problems related to health, education, employment, crime, community, housing, and the physical environment. At 4 and 6 year follow-up, adult PA had not improved in the target areas, neither when looking at absolute change, nor when looking at change relative to that in similarly deprived areas [18,19]. In 2007, the District Approach was introduced in the forty most deprived districts of the Netherlands. This ABI aimed to improve the living conditions in these forty areas by tackling problems related to employment, education, housing, the physical environment, safety, and social interaction. At 3 year follow-up, target areas saw larger improvements in leisure-time walking (LTW) trends than the rest of the country [20]. There were no changes in trends of leisure-time cycling and sports among adults.

None of these studies have explored *how* these ABIs have influenced PA of adults living in deprived areas. To be able to improve future ABIs, various researchers have expressed the need to go beyond the quantitative changes in PA and try to understand how these changes have been produced [21-24]. Therefore, the current study aimed to explore the pathways by which ABIs might influence PA of adults living in deprived areas. More specifically, we aimed to explore the pathways by which the environmental interventions of ABIs might stimulate LTW among adults in deprived

areas. We focused on LTW because prior quantitative evaluation studies have identified this to be the only PA outcome that had improved following an ABI [18-20].

METHODS

We applied a realist approach [25,26]. This theory driven evaluation approach is very much suited to uncover the inner workings of complex programmes like ABIs. The realist approach aims to uncover how programmes work, for whom, and in what conditions. Three concepts are central to the realist approach: mechanisms, contexts, and outcomes. *Mechanisms* refer to the choices and capacities that are offered to a person by the programme. Whether and how these mechanisms are enacted upon and what *outcomes* they produce, depends on the *context* in which they are activated. Contextual factors may reside at the individual or environmental level. Each programme has an underlying theory of how the programme is assumed to work and what outcomes are expected from it. A realist researcher has the task of identifying this programme theory and of systematically gathering evidence to test and refine this theory.

Our realist review was guided by the key steps described by Pawson et al. [26]. Each step is described in the following sections.

Step 1: articulate the initial programme theory

First, we developed an initial programme theory on how the environmental interventions of ABIs may be expected to stimulate LTW in deprived areas. We performed an exploratory search of the peer-reviewed literature to identify frameworks and theories that describe how the neighbourhood environment can potentially influence PA. We did not specifically focus on LTW and deprived areas, as such frameworks and theories are currently not available (to our knowledge). We selected frameworks and theories that focused on the neighbourhood environment as point of entry for interventions, thereby excluding the multitude of psychosocial theories that focus exclusively on the individual. The search was non-systematic and meant to identify the key ideas set out in the literature.

Step 2: search for evidence

We searched the peer-reviewed literature for evidence to test and refine our initial programme theory. The search was iterative and ongoing throughout the study. The search was limited to articles published in English or Dutch. Three databases were searched: two multidisciplinary databases (Google Scholar, Web of Science) and one health-specific database (PubMed). Search terms included various combinations of

synonyms for “neighbourhood”, “deprivation”, and “walking”. We additionally searched for articles which cited or were cited by the articles that were eligible for inclusion (see step 3).

Step 3: appraise the evidence

Following the realist principles, articles were not included or excluded based solely on their study design [26]. Rather, articles were judged on their ability to provide evidence for theory testing, i.e. their relevance, which was appraised in two steps. First, abstracts were judged based on three criteria: a) study focused on the relation of the neighbourhood environment or neighbourhood environmental interventions with general walking, LTW, general PA, or health, b) study focused on adults or older adults, c) study focused on deprived areas or made comparisons between deprived and non-deprived areas. Second, full-text articles of all eligible abstracts were judged based on three additional criteria: d) results referred to general walking or LTW, e) results provided evidence on the mechanisms by which the neighbourhood environment or neighbourhood environmental interventions influence general walking or LTW, f) in case the study focused on both deprived and non-deprived areas, results were clearly sorted by area.

Step 4: extract and synthesize the evidence

Data extraction and synthesis was guided by the framework approach of Ritchie and Spencer [27]. First, we indexed the evidence in the articles. We did so by flagging evidence about the mechanisms by which the neighbourhood environment or a neighbourhood environmental intervention influenced general walking or LTW, and evidence about personal factors that influenced whether these mechanisms were activated. Evidence was not flagged when about general PA, health, types of walking other than LTW, types of PA other than walking, adolescents, children, or non-deprived areas. Flagging was guided by our programme theory, but we were also alert for unanticipated mechanisms and contextual factors. Second, we charted the extracted evidence. Evidence from all articles was collected in a word document and sorted by type of mechanism. Finally, we mapped and interpreted the evidence. Recurrent patterns of evidence were grouped and labeled. Patterns were regularly discussed with the members of the research team. Data extraction and analysis was iterative, in that when new patterns emerged, data sources were checked again for additional evidence.

RESULTS

Initial programme theory

Figure 1 displays our initial programme theory and describes how the environmental interventions of ABIs may be expected to stimulate LTW in the context of area deprivation. The outline of the theory was based on conceptual frameworks developed by Kremers et al. [28] and Ogilvie et al. [29]. ABIs may cause various environmental changes in deprived areas, which may in turn activate a wide range of cognitive processes (i.e. mechanisms) that may stimulate LTW among adults. Whether these mechanisms are activated may depend on personal factors, such as age and gender.

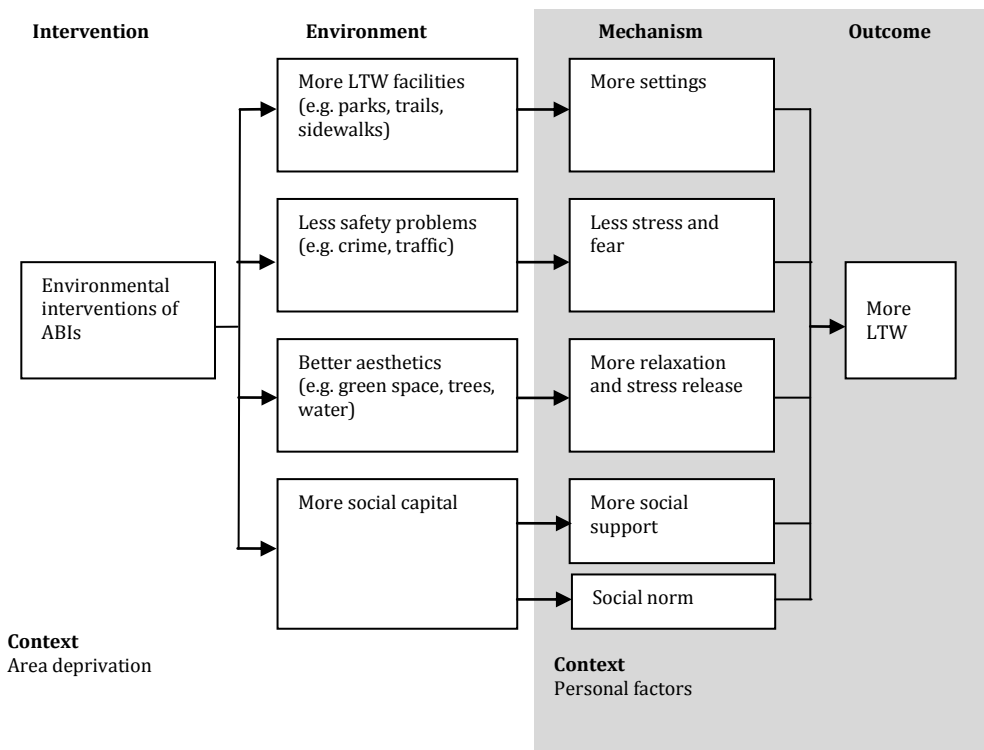


FIGURE 1. Initial programme theory

More specific information on what environmental changes may activate what mechanisms was derived from two reviews of theories on how the physical [30] and social [31] environment may influence leisure-time PA. Five potential pathways were identified. First, Barker's behavior setting theory posits that an increase in parks,

trails, sidewalks, and other LTW facilities may create more *settings* for LTW, and hence stimulate LTW [30]. Second, Evan and Cohen's environmental stress theory posits that a reduction in crime, traffic, and other safety problems may lower levels of *stress and fear*. Hence, levels of LTW may increase [30]. Third, Kaplan's restorative environments theory posits that an increase in green space, trees, water, and other aesthetic features may create more fascination and a sense of being away, thereby enabling more *relaxation and stress release*. Hence, levels of LTW may increase [30]. Fourth, Berkman and Kawachi posit that higher levels of social capital may create more *social support* (including emotional, instrumental, informational support) for LTW, and hence stimulate LTW [30]. Fifth, Berkman and Kawachi posit that higher levels of social capital may reinforce positive *social norms* for LTW, and hence stimulate LTW [31].

Evidence

A total of 13 articles were included to test and refine our initial programme theory (Table 1). Publication dates ranged from 2006 to 2013. All studies applied a qualitative research design. We excluded all quantitative studies due to a lack of evidence on mechanisms. Studies were performed in New Zealand (N=1), Canada (N=1), USA (N=3), the Netherlands (N=1), Scotland (N=1), Ireland (N=2), and England (N=4). Study populations included older adult residents (N=4), adult residents (N=6), Latino female mothers (N=1), African American adult residents (N=2), young adult residents (N=3), key neighbourhood informants (N=1), and planners (N=1) (some studies include multiple study populations). Studies either aimed to explore associations of the neighbourhood environment with walking, PA, or health (N=10), or evaluated the impact of a specific PA intervention (N=3).

From the evidence we derived a total of six mechanisms by which ABIs in deprived areas might stimulate walking among adults that live in these areas. These mechanisms are detailed below. The first four mechanisms were in line with our initial programme theory.

1. More settings

Two studies indicated that adults in deprived areas refrained from walking because their neighbourhood did not provide enough settings for walking [39,43]. Sidewalks, trails, and local parks were mentioned as primary walking settings [43]. Adults in the two studies mentioned that their neighbourhood did not provide any of these.

TABLE 1. Characteristics of included articles

#	Authors, year	Design	Context	Aim
32	Annear et al., 2009	<ul style="list-style-type: none"> • Case study • Interviews • Qualitative 	<ul style="list-style-type: none"> • Christchurch, New Zealand • 1 deprived suburban area; 1 non-deprived suburban area • 63 elderly (65-91 years old) 	How does area deprivation affect leisure-time physical activity among older adults?
33	Burgoyne et al., 2007	<ul style="list-style-type: none"> • Case study/evaluation • Focus groups • Qualitative 	<ul style="list-style-type: none"> • Countryside, Ireland • 2 deprived areas • 53 adults (18-60 years old) 	How does the neighbourhood environment affect walking? What was the impact of the Sli-na-Slaime walking route?
34	Burgoyne et al., 2008	<ul style="list-style-type: none"> • Case study • Focus groups; interviews • Qualitative 	<ul style="list-style-type: none"> • Cork, Ireland • 2 adjacent deprived areas • 80 adults 	What are determinants of engaging in physical activity?
35	Coulson et al., 2011	<ul style="list-style-type: none"> • Case study/evaluation • Focus groups before, after, and during the intervention • Qualitative 	<ul style="list-style-type: none"> • Bristol, England • 1 deprived area • 36 adults 	How has home zone remodeling and construction of the renewal of an existing cycle-walkway in a deprived area affected quality of life and physical activity?
36	Day, 2008	<ul style="list-style-type: none"> • Case study • Focus groups; interviews • Qualitative 	<ul style="list-style-type: none"> • Glasgow, Scotland • 1 highly deprived urban area; 1 medium deprived suburban area; and 1 non-deprived coastal area • 45 retired elderly (62-90 years old). 	How does the local outdoor neighbourhood environment affect older people's health?
37	Gidlow & Ellis, 2011	<ul style="list-style-type: none"> • Case study • Focus groups • Qualitative 	<ul style="list-style-type: none"> • North Staffordshire, England • 1 deprived urban area • 35 adults (mean age 48); 23 young people (12-15 years old) 	How do people perceive their local green space and what are barriers for use?
38	Grant et al., 2010	<ul style="list-style-type: none"> • Case study • Focus groups; interviews; observations • Qualitative 	<ul style="list-style-type: none"> • Ottawa, Canada • 1 deprived urban area; 1 deprived suburban area; 1 non-deprived urban area; 1 deprived suburban area • 75 elderly (65+ years old); 19 neighbourhood key informants 	How do urban form and area SES affect walking among older adults?
39	Griffin et al., 2008	<ul style="list-style-type: none"> • Case study • Focus groups • Qualitative 	<ul style="list-style-type: none"> • South Carolina, USA • 1 deprived suburban area; 1 non-deprived suburban area • 27 African American adults (age unknown) 	How does safety and other environmental factors influence physical activity among African American residents of low-income, high-crime areas?
40	Kamphuis et al., 2007	<ul style="list-style-type: none"> • Case study • Focus groups • Qualitative 	<ul style="list-style-type: none"> • Eindhoven, the Netherlands • 1 group of high educated individuals in non-deprived areas; 1 group of low educated individuals in deprived areas • 38 adults (29-81 years old) 	How do perceptions of the neighbourhood environment influence physical activity and fruit and vegetable consumption across socio-economic groups?
41	Parry et al., 2007	<ul style="list-style-type: none"> • Case study • Focus groups 	<ul style="list-style-type: none"> • Birmingham and the Black Country, England 	How do residents of disadvantaged communities

		<ul style="list-style-type: none"> • Qualitative 	<ul style="list-style-type: none"> • 3 highly deprived areas targeted by the area-based initiative New Deal for Communities • Young adults (16-20 years old); older adults (60+ years old). Numbers unknown. 	believe where they live influences their health?
42	Trayers et al., 2006	<ul style="list-style-type: none"> • Case study/evaluation • Focus groups before the intervention • Qualitative 	<ul style="list-style-type: none"> • Bristol, England • 1 deprived area • 10 local residents; 9 primary school pupils (9-10 years old); 10 college students and tutors; 3 local planners 	What health and physical activity benefits do diverse groups of stakeholders perceive from the proposed home zone remodeling and new cycle-walkway?
43	Wilson et al., 2013	<ul style="list-style-type: none"> • Case study • Focus groups • Qualitative 	<ul style="list-style-type: none"> • South Carolina, USA • 2 low income and high crime areas • 52 African American adults (18-65 years old) 	How do African American adults perceive that neighbourhood walking can be promoted using the 5 social marketing principles of product, price, place, promotion, and positioning?
44	Yen et al., 2007	<ul style="list-style-type: none"> • Case study • Focus groups • Qualitative 	<ul style="list-style-type: none"> • Salinas, USA • 1 highly deprived area; 1 medium deprived area; 1 non-deprived area • 52 women with at least one child under 18 living at home (age unknown). Most Latinos. 	How do women perceive their neighbourhood to promote or hinder diet, physical activity, and smoking?

2. Less fear and stress

All thirteen studies indicated that adults in deprived areas refrained from walking because their neighbourhood environment induced fear [32-44]. Various neighbourhood problems were mentioned to make adults fearful, scared, afraid, unsafe, intimidated, concerned, and uncomfortable, hence causing them to refrain from walking altogether or from walking in specific places like local parks:

First, nine studies mentioned that *crime and antisocial behaviour* created fear [32-34,36,37,39-41,44]. Problems that were cited included burglary, vandalism, assault, drug dealing, drunk people, unfriendly neighbours, and youth gangs. Youth gangs were most often mentioned to be problematic. Interestingly, while some adults requested more police presence to deal with some of these problems and hence feel safer, others mentioned how high police presence acted as an indicator of high levels of crime and antisocial behavior and hence created fear [32].

Second, seven studies indicated that *lack of lighting* created fear [33-35,37,39,41,43,44]. Adults mentioned how they did not walk at night, because that is when youth gangs and other unreliable people were perceived to be most active

[33,37,40,44]. Adults also mentioned that poorly lit areas caused them to be fearful [34,37,39,41,43]. However, two studies indicated that increased lighting may not be the solution to fear. In one study, a woman mentioned to be fearful even in lighted areas [43]. Moreover, an evaluation study revealed that despite the installment of adequate lighting, adults still avoided walking on the renewed cycle-walkway [35].

Third, four studies described how *dense areas of trees and isolation* caused fear [35,37,42,43]. These features were suggested to cause fear because they impaired visibility. First, visibility was impaired because subjects weren't able to see potential offenders. An evaluation study of a renewed cycle-walkway indicated that, despite the installment of lighting, adults still avoided walking on it because they remained fearful as a result of overgrowing trees on the trail which provided potential hiding places for offenders [35]. This issue was also mentioned by adults in another study when asked why they avoided walking in the nearby park [37]. Second, visibility was impaired because other residents weren't able to see the subjects. Adults remained fearful on the renewed cycle-walkway not only because of overgrown trees, but also because of its isolated location [35,42]. Most relished the prospect that more users would give the route a busier and safer feel [35]. In another study, adults mentioned the desire for an open view of surroundings, so they could keep an eye on their children and other people could keep an eye on them [43].

Fourth, four studies indicated that *traffic* imposed fear [32,33,36,38]. High traffic volume of motorized vehicles was mentioned to induce fear [32,33,36,38]. Older adults suggested that having a sidewalk may relieve some of this fear [38]. However, they also mentioned that the presence of cyclists and skateboarders on these sidewalks and on trails induced fear [38]. In one study, adults mentioned that high traffic volume may actually reduce stress because it increases visibility and thereby reduces the chance that people will commit crime or behave in an antisocial manner [33].

Fifth, four studies mentioned that the presence of *stray dogs* caused fear [32,33,39,43]. Sixth, two studies mentioned that *uneven surfaces* created a fear of getting hurt [36,43].

Certain personal and interpersonal factors were mentioned to affect the amount of fear created by the abovementioned neighbourhood problems. First, two studies mentioned that *women* were more fearful of crime, antisocial behaviour, and dogs than were men [39,43]. Second, one study mentioned that adults *with children* were especially fearful of traffic [33]. Finally, two studies indicated that *walking with others* may relieve some of the fear associated with neighbourhood problems. In the one study, a woman mentioned that safety had become a really big issue for walking, especially when walking alone [43]. The other study mentioned that only a small

number of individuals used the renewed cycle-walkway, particularly with company [35].

3. More relaxation and stress release

Eight studies indicated that adults in deprived areas refrained from walking because the poor aesthetics of existing settings for LTW did not enable relaxation and enjoyment [32-36,39,40,43]. Two neighbourhood features were mentioned to enable relaxation and enjoyment. First, four studies mentioned that adults liked to walk in *nature*, because the scenery, trees, animals, and fresh air offered them relaxation and stress release, attracted their attention, offered them the chance to experience the country side, and made walking fun and enjoyable [33,34,40,43]. Second, one study mentioned that adults were motivated to walk for pleasure in areas with nice *architecture* because they were experienced to be interesting [36].

Unfortunately, various neighbourhood factors were mentioned to compromise the relaxation and enjoyment offered by architecture and nature, thereby constraining its positive influence on walking. First, six studies mentioned that current settings for walking were *neglected* and filled with litter, graffiti, glass, dog excrement, and rubbish [32-36,39]. This kept adults from walking by creating an unattractive, unclean, unappealing environment for walking. An evaluation study revealed that it compromised greater usage of a renewed cycle-walkway [35]. Second, two studies indicated that local open green spaces did not attract people's attention because they were *dull to look at* and hence did not stimulate walking [36,40]. Third, the evaluation study of a new walking route revealed that because of its *location* near the road and estates, it did not meet the need for fresh air and experience of the countryside [33].

4. More social support

Six studies indicated that adults' decision to walk in deprived areas was influenced by the amount of social support – especially emotional support – offered by the social neighbourhood environment [32-34,36,39,43]. Adults mentioned that they often walked with friends, family, or neighbours [33,34,43]. Having someone to walk with appeared to provide various types of emotional support, including motivation, stimulation, and enjoyment [32-34,36,39,43]. In only two studies adults mentioned that not having anyone to walk with was a barrier to walking [32,43]. Two other studies mentioned that some adults preferred to walk alone, because they did not want to be slowed down or depend on others [34,43]. Certain personal factors were mentioned to affect the importance of social support for LTW. *Women* tended to value social support more than did men [33,34,39,43].

As opposed to our theory, instrumental support did not appear to be important for walking, as walking was associated with less cost than other types of PA like sports [34].

We identified two additional mechanisms that were not covered by our initial programme theory.

5. More convenience

Seven studies indicated that adults in deprived areas refrained from walking because the poor infrastructure surrounding existing LTW facilities made it inconvenient to reach and use them [32,35,36,38,39,42,43]. Studies mentioned how specific problems made walking settings inconvenient to use. First, existing settings were located *too far away* from home [32,38,39,43]. This was mentioned to be inconvenient, especially among older adults, who were unable to drive or walk up there [32]. Second, existing settings *lacked connectivity* [35,42]. Evaluation studies of a renewed cycle-walkway indicated that adults did not use the setting for walking because it represented a place to nowhere, even though beforehand it was expected to provide easier routes to walking settings located further away [35,42]. Third, existing settings *lacked benches* [36,38]. Studies mentioned that older adults needed frequent places to sit and rest along the route to be able to walk longer distances [36,38]. Some benches were available, but they were often vandalized [36].

6. More social interaction

Two studies indicated that adults' decision to walk in deprived areas was influenced by the amount of opportunities for social interaction while walking offered by the social neighbourhood environment [36,43]. Adults mentioned that the potential for impromptu social interaction when outside was highly valued [36]. The possibility of running into familiar people was mentioned to make walking fun [43].

Refined programme theory

Using the evidence derived from the 13 studies, we refined our initial programme theory (Figure 2). The refined programme theory posits that there are three main pathways by which ABIs might stimulate LTW among adults in the context of area deprivation (these are displayed in bold). First, by reducing safety problems and improving the physical neighbourhood design, ABIs may reduce the amount of fear to use existing walking facilities. Second, by improving the infrastructure surrounding existing walking facilities, ABIs may make them more convenient to be use. Third, by improving neighbourhood aesthetics, ABIs may make existing walking facilities more relaxing and stress releasing. The refined programme theory posits three additional

pathways by which ABIs may stimulate LTW among adults in the context of area deprivation, but these are less well supported by the evidence. First, by increasing the amount of LTW facilities, ABIs may increase the amount of settings for LTW. Second, by improving social capital, ABIs may increase the amount of social support for LTW. Third, by improving social capital, ABIs may increase opportunities for social interaction while doing LTW. There was some evidence to suggest that a reduction in fear following an ABI might have more impact on the LTW behaviour of women, families, and lone walkers, but evidence was limited and restricted to the pathway of fear.

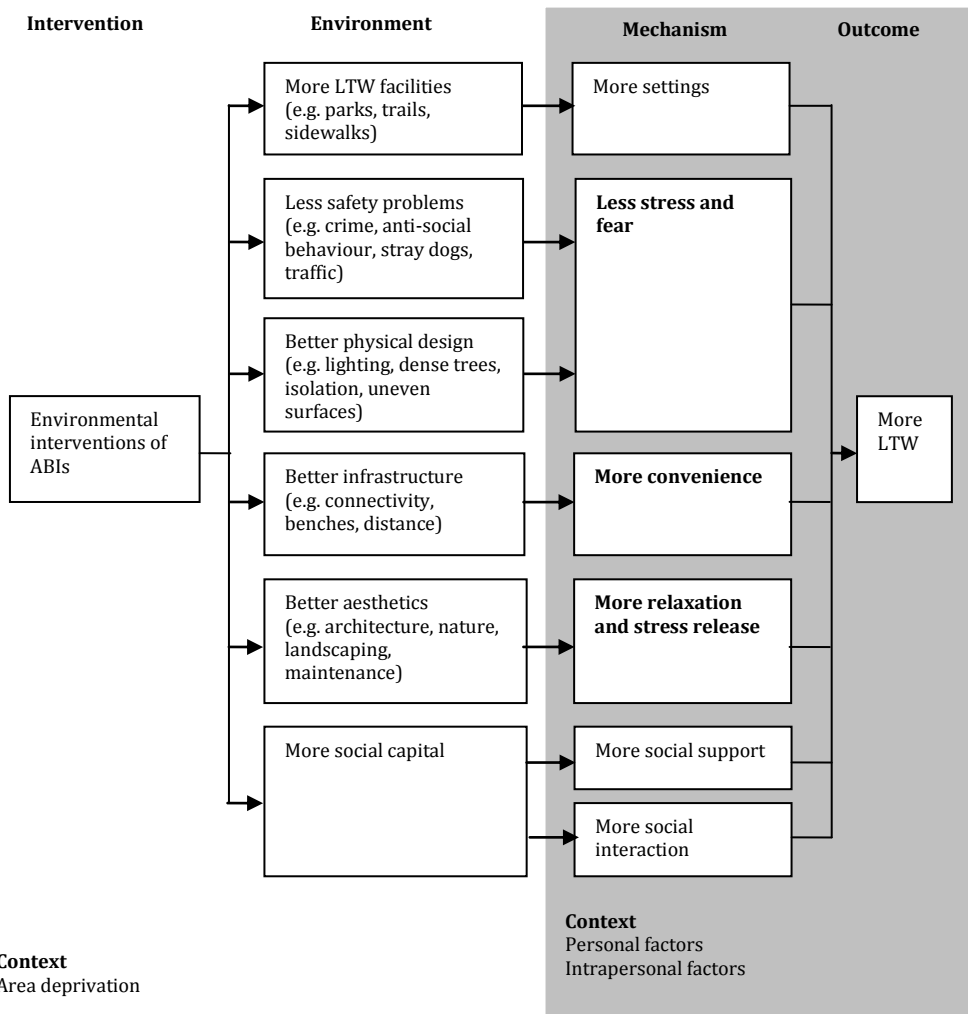


FIGURE 2. refined programme theory



DISCUSSION

This study aimed to explore the pathways by which ABIs might stimulate LTW among adults in deprived areas. A realist review of 13 peer-reviewed articles revealed three main pathways. First, all studies indicated that less safety problems and better physical neighbourhood design might reduce levels of stress and fear in existing LTW facilities. Second, half of the studies indicated that better neighbourhood aesthetics might improve opportunities for relaxation and stress release in existing LTW settings. Third, half of the studies indicated that better infrastructure of existing LTW facilities might increase the convenience with which they can be reached and used. Three additional, less well supported pathways were identified. First, some studies indicated that more LTW facilities might create more settings for LTW. Second, a few studies indicated that more social capital might provide more social support for LTW. Third, some studies indicated that more social capital might provide more opportunities for social interaction while walking.

Limitations

Several considerations need to be taken into account when interpreting the results of this realist review. Evidence to test and refine our initial programme theory was not gathered in a systematic way. Rather, we aimed to seek out a representative body of literature on which to test and refine our initial programme theory. The realist approach acknowledges that it cannot identify all potentially relevant evidence [26]. However, we may have missed out on some relevant evidence.

Only few studies included in this review evaluated how environmental interventions changed the neighbourhood environment and hence influenced LTW. The majority of studies explored how the neighbourhood environment had an impact on LTW. While this type of study provides valuable information on how environmental changes might affect LTW, people may respond differently to actual neighbourhood change. More evaluation studies of how interventions in deprived areas influence LTW are needed.

The realist approach aims to uncover how, for whom, and in what conditions programmes work or don't work. We were able to shed much light onto how ABIs may stimulate LTW. However, we gained only limited insight into for whom and in what conditions ABIs may stimulate LTW, besides the fact that our findings were restricted to adults and deprived areas. We found some evidence to suggest that interventions that aim to reduce fear may have more of an impact on women, families, and lone walkers, but evidence was limited and restricted to the pathway of fear. Moreover, we gained no insight into the potentially moderating role of higher-level contextual factors. The studies included in our review originated from a wide range of countries. Country-level factors such as culture and geographical characteristics may likely affect

how ABIs influence LTW, but these were not explicitly mentioned. While some pathways seemed to be universal, such as the role of fear, others were only mentioned in studies from certain countries. Therefore, it is difficult to determine the generalisability of our refined programme theory across countries.

Implications for theory

The results of this study have some implications for existing theories on how the neighbourhood environment may influence PA among adults. One of the most important implications is that existing theories are too fragmented and too focused on one single neighbourhood aspect to be able to fully explain the complexity of environmental influences on PA in general and LTW in specific. All studies included in our review highlighted a wide range of neighbourhood problems that simultaneously influenced LTW. Moreover, results of the three evaluation studies indicated that improving just one or two aspects of the neighbourhood environment was not sufficient to improve LTW as many other unresolved environmental problems kept hindering LTW.

When looking at individual theories, results of this study provide only limited support for Barker's behavior setting theory [45]. This theory posits that the neighbourhood environment may stimulate PA by providing settings for PA. However, only a limited number of studies mentioned the unavailability of LTW facilities in deprived areas as a barrier for walking.

Our results provide strong evidence for Evan and Cohen's environmental stress theory [46], which posits that a reduction in crime, traffic, and other safety problems may reduce levels of stress and fear, and hence stimulate LTW. All studies included in our review revealed that safety problems indeed kept people from walking in existing LTW facilities in deprived areas because of fear. Results of our review add to Evan and Cohen's environmental stress theory by indicating that fear may not only be caused by safety problems, but also of poor physical neighbourhood design. This is consistent with Newman's theory of defensible spaces [47] which posits that the physical layout of neighbourhoods may influence natural surveillance options, hence influencing how much residents feel in control of the areas around their homes, and consequently how fearful they are.

We found quite some support for Kaplan's restorative environments theory [48], which posits that nature may encourage individuals to participate in PA by offering fascination and a sense of being away, thereby offering relaxation and stress release. Half of the studies included in our review revealed that poor neighbourhood aesthetics indeed kept people from walking in deprived areas because of limited options for relaxation and stress release. Our study adds to Kaplan's restorative

environments theory by indicating that nature will only offer relaxation and stress release if well maintained and properly landscaped. Moreover, there was some evidence to suggest that relaxation may not only be enabled by nature but also by interesting architecture.

There was mixed support for Kawachi and Berkman's ideas about the role of social capital in PA [49]. They posit that higher levels of social capital may stimulate LTW by creating more social support for LTW and helping reinforce positive social norms for LTW. Half of the studies included in our review revealed that high levels of social capital may indeed promote walking in deprived areas by creating more social support. However, levels of social support were generally high in deprived areas, thereby questioning the ability of ABIs to stimulate LTW via this pathway. Only two studies indicated that adults in deprived areas refrained from walking because of low social support. Moreover, social support was not only provided by neighbours but also by family and friends, which are not targeted by ABIs when living in other areas. None of the studies included in our review mentioned anything about social norms for LTW. Our study adds to Kawachi and Berkman's ideas by indicating that higher levels of social capital may also stimulate LTW by offering more opportunities for social interaction while walking. However, only a limited number of studies highlighted this pathway.

CONCLUSIONS

Results of this realist review indicate that ABIs may stimulate LTW among adults in deprived areas, not so much by creating more settings for LTW or by enhancing social stimuli to walk, but more so by making existing LTW facilities less frightening, more convenient, and more relaxing. To improve the quality of existing LTW facilities, policy makers and practitioners are advised to pay attention to safety problems, the physical neighbourhood design, the neighbourhood infrastructure, and neighbourhood aesthetics.

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