Inactive lifestyles in peri-urban Australia: A qualitative examination of social and physical environmental determinants

Abstract

Issue addressed: Australians living in peri-urban areas are insufficiently active, sedentary, and experience poorer health than people in major cities. There are health benefits attributable to active lifestyles that could contribute to the improved health and wellbeing of this population. To support the adoption of active lifestyles it is important to understand the unique context in which behaviour occurs.

Methods: The aim of this study was to identify characteristics of the social and physical environment that may impact active lifestyles. Semi-structured interviews were conducted in peri-urban southern Queensland. Data was analysed by thematic analysis.

Results: The natural environment, weather, distance, accessibility and walkability were features of the peri-urban physical environment relevant to active lifestyles. Social factors included social capital and crime. Activity-supportive characteristics (e.g. community spirit) were identified, in addition to active lifestyle barriers (e.g. lack of public transport).

Conclusions: Despite activity-supportive social and environmental characteristics, most participants reported inactive lifestyles. The barriers to active lifestyles in peri-urban environments may negate these activity-supportive features. Some barriers are difficult to modify (e.g. distance and accessibility). However, some may be alleviated through the adoption of activity-supportive policy and urban design (e.g. pedestrian mobility infrastructure).

So what? Strategies to support active lifestyles in peri-urban environments must take into account unmodifiable contextual barriers, whilst encouraging utilisation of existing activity-supportive infrastructure and resources. The enhancement of activity-supportive environments through improved neighbourhood walkability and the usability of public transport may encourage some peri-urban residents to undertake more active forms of transport and recreational physical activity.

Summary

People in peri-urban Australia are insufficiently active, sedentary and suffer poorer health than city dwellers. Supporting active lifestyles represents an opportunity to improve the health of this population. This qualitative study identified characteristics of the peri-urban social and physical environment that may act barriers or facilitators to active lifestyles.

Key words: physical activity, sedentary behaviour, health behaviour, non-metropolitan, qualitative methods,

Introduction

Physical inactivity is estimated to cause between 6 -10% of major non-communicable diseases and 9% of premature mortality worldwide.[1] Sedentary behaviour has also been associated with increased risk of all-cause mortality, particularly among those who perform low levels of physical activity.[2, 3] Although leisure-time physical activity levels among Australians increased slightly in the decade between 2002 and 2012, many remain inactive (i.e., not physically active) and sedentary (high amounts of sitting).[4] Moreover, Australians residing in peri-urban areas (i.e. areas classified as inner-regional in accordance with the Australian Statistical Geography Standard – Remoteness Structure; ASGS-RS) and in more geographically remote locations (i.e. those classified as outer-regional and remote) have been shown to be less active than people living in major cities.[5, 6] Estimates of the proportions of each population classified as sufficiently active are lowest in peri-urban areas (36%), compared to 39% in remote areas and 45% in major cities.[5] In contrast, Australians living in peri-urban areas spend similar time performing sedentary behaviours (35.2 hours per week) compared to those in remote areas (36 hours per week), but less than those in major cities (40.2 hours per week).[5] These characteristics of peri-urban populations suggest that there may be unique features of peri-urban environments distinct from those in metropolitan and more remote locations that impact active lifestyle participation. Therefore, a close examination of the factors that influence physical activity and sedentary behaviour is warranted.

Almost one-fifth of Australian residents live in peri-urban locations, which may be conceptualised as areas outside of major cities characterised by some restricted access to goods, services and opportunities for social interaction.[7] Indeed, peri-urban populations represent a significant proportion of the global population, with almost half of the worlds' urban dwellers residing in settlements of less than 500,000 inhabitants.[8] Residents of peri-urban Australia are more likely to be overweight or obese, have high blood pressure, high cholesterol, and are more likely to die prematurely from cardiovascular disease, cancers, respiratory diseases, and suicide compared to those in major cities.[9] Thus, the inactive lifestyles of this population are particularly concerning given the known health risks of physical inactivity and sedentary behaviour. Improving active lifestyle participation could provide tremendous benefit to the health of people of peri-urban Australia.

Understanding the context in which health behaviour takes place is of critical importance for health promotion.[10] The Ottawa Charter for Health Promotion states that health promotion strategies should be crafted to suit local needs and should aim to reduce

health inequities, ensuring supportive environments and access to information, while providing individuals with life skills and opportunities for healthy choices.[11] As physical activity participation does not simply decline in a linear manner with increasing remoteness, contextual factors beyond road distances to populated localities are likely impacting the degree to which peri-urban environments support active lifestyles. Despite differences in participation and the relative health disadvantages faced by peri-urban populations, limited research has been specifically directed towards identifying the range of contextually-relevant determinants of physical activity and sedentary behaviour within this population. Whilst research has been conducted in 'rural' settings in Australia and around the world, the term 'rural' has often been applied to reference any geographic setting outside of major cities, and thus lacks contextual specificity. Of the studies that have been conducted specifically in peri-urban environments, research has focused on discrete ranges of behavioural determinants, sub-sections of populations, or solely on physical activity without consideration of sedentary behaviour. For example, Mummery and colleagues investigated associations between social capital and physical activity among adults in inner-regional Rockhampton, Australia (N = 1278).[13] Participants reporting the highest levels of social capital were 67% less likely to be inactive compared to those reporting the lowest levels of social capital. Whilst such studies provide insight into specific predictors of behaviour, a broader investigation of the peri-urban environmental context would facilitate a more complete understanding of inactive lifestyles within this population. Further, given the association of sedentary behaviour with negative health outcomes, especially for those with low levels of physical activity, it is important to build an understanding of the determinants of sedentary activity in addition to those of physical activity.

More generally, reviews of the correlates of physical activity without consideration of geographic remoteness have found consistent evidence of positive associations between physical activity and the accessibility of facilities, the existence of sidewalks/footpaths, population density and neighbourhood aesthetics.[14] Although studies of social and physical environmental correlates of sedentary behaviour were limited, Prince and colleagues found preliminary evidence of negative associations between transport-related sedentary behaviour and neighbourhood walkability, and with residential density and road intersection density.[15] The relevance of these factors upon active lifestyle behaviours, specifically within peri-urban environments, and whether there are additional unique characteristics of influence, is largely unknown.

The aim of the present research, therefore, was to identify social and physical environmental characteristics of peri-urban environments that might influence physical activity and sedentary behaviour. The study was conducted in southern Queensland, Australia. Qualitative methodology in the form of semi-structure interviews was utilised to allow for an in-depth investigation of the social and physical environmental characteristics that may contribute to inactive lifestyles that was not restricted by pre-determined theories of behavioural determinants.

Methods

Setting and participants

The study was conducted in the Lockyer Valley, Scenic Rim, Somerset, Southern Downs and Toowoomba local government areas (LGAs). These are primarily classified as inner-regional, in accordance with the ASGS-RS.[6] Spread over 32,000 km^2, more than 305,000 people live in the region, which includes the large regional centre of Toowoomba with a population of 164,595.[16] The remaining LGAs are less populous ranging between 25,173 in Somerset and 40,975 in the Scenic Rim.[16] Toowoomba is situated approximately 130 kilometres from the nearest major city (Brisbane), whilst Somerset is adjacent to Brisbane. A map of the region is presented in Figure 1. Consistent with the overall peri-urban population, people within the study region are more likely to be obese, suffer mental health problems, report high or very high psychological distress, and to die prematurely from suicide compared to the overall Australian population.[17]

Fig. 1. Map of the five local government areas included in the study.

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Recruitment was conducted in mid 2016. The study was advertised via unpaid distribution on Facebook, and was targeted to groups located within the selected regions (e.g. Toowoomba Facebookers). English-speaking adults of at least 18 years of age, who resided in inner-regional southern Queensland at the time of the study and for at least one year prior, were eligible to participate. Ethical approval for human research was attained through the host institution. Study information was provided to participants prior to completion of an online eligibility questionnaire. Consent was attained upon completion of an online demographics questionnaire, which participants were automatically directed to upon confirmation of eligibility. Participation was voluntary, and a prize draw for two $50 gift cards was conducted as an incentive for interview participation. The Consolidated criteria for Reporting Qualitative research (COREQ) guidelines were applied when reporting this research.[18]

Twenty-two participants aged between 23 and 74 years (M = 46.41) completed the demographics questionnaire. Ten were classified as obese (46%), five overweight (23%), and seven within the healthy weight range (32%).[19] Participants were then invited to participate in an interview. One person declined to participate, one did not respond, and two did not provide contact details. In total, 17 people from Toowoomba (n = 4), Somerset (n = 4), Southern Downs (n = 5), Lockyer Valley (n = 5), and Scenic Rim (n = 2) participated in the interviews. Thirteen were female (77%). Seven reported living within a town area (41%), while 10 reported living outside of a town (59%). Each participant was allocated a unique identifier (e.g. P01), and personal identifying information was removed from the findings to ensure participant confidentiality and anonymity.

Data collection and analysis

Semi-structured interviews took place in June 2016. The interviews were facilitated by the first author, a female PhD candidate with a Bachelor of Science (Honours) in Psychology and considerable experience (> 10 years) conducting non-research related interviews. No relationship between the interviewer and participants existed prior to the scheduling of interviews. Participants were advised that the study formed part of the interviewers PhD-related program of research. Due to the graphical dispersion of the sample, interviews were conducted using Skype. Only the interviewer and participant were present during the interviews. A questioning route was drafted to act as a broad roadmap of topics to be included. However, the approach was purposely flexible, to allow for exploration of issues raised by participants. A summary of the questioning route is provided in Table 1. The questions were reviewed and agreed by JO, SM, CB, and MI. The first interview served as a pilot to field test the questioning route, with no adjustments required upon review. Interviews ranged between 25 and 71 minutes in duration, and were conducted until the point of data saturation.

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All interviews were audio-recorded and transcribed verbatim. Participants were provided an opportunity to review and correct the transcript prior to analysis. Data were evaluated using thematic analysis, informed by Braun and Clark.[20] An essentialist/realist epistemological position was adopted. NVivo software was used to develop a codebook of major themes and common patterns. First, an inductive approach to analysis was undertaken to allow for detection of ideas not restricted by known correlates of behaviour. Through this phase, factors explicitly reported by participants as impacting physical activity or sedentary behaviour were identified. Next, themes and ideas were analysed to identify known

behavioural correlates. The first author conducted the initial coding, with three of the other authors independently reviewing the coding. Data were then summarised into meaningful categories by consensus, and statements selected to support specific themes.

Results

The findings include environmental characteristics of peri-urban localities that impacted the physical activity and sedentary behaviour of participants, and environmental attributes described by participants that have previously been identified as behavioural correlates in the literature, even if behavioural impact was not explicitly stated. The findings are presented in two themes. The first encapsulates social environmental factors relevant to the conduct of active lifestyle behaviours, including social capital and crime. The second encapsulating physical environmental factors, including the natural environment and weather, distance and accessibility, and walkability.

Social Environment

The first theme represents characteristics of the social environment that impacted the active lifestyle behaviours of participants, or are known behavioural correlates. Subthemes include social capital and crime.

Social capital

Participants portrayed a strong sense of neighbourliness, community spirit, cohesion, and trust. Formal social clubs, volunteer organisations, theatre companies, art galleries, school communities, church groups, and informal groups provided opportunities for social participation:

> It’s an area of lovely people and it’s a wonderful community. Everyone knows each other and if you’re not meeting the neighbours at the Rural Fire when you do fire training, you’re meeting them at the local hall when there’s a sing along. (P08)

Strong community support of local sporting teams was also expressed. One participant described sporting clubs as a social hub for families:

> [Sports clubs are] sort of a central hub for families during the winter season, like your sports such as soccer, hockey and netball. (P16)

However, only three participants reported personal sport participation. Some explained that they did not identify as a ‘sporting person,’ whilst others reported lack of time as a barrier to participation. Another participant described an increased interest in health behaviours in the local community, however, did not participate herself, although did not explain why:

> We've just got a massive gym put in … It's like a craze at the moment and I think people are trying to … attend these health places as well. Whether it's just a sign

> of the times, people realise we do need to be healthy. I myself don't do any of that but a lot of people do. (P17)

Participants also reported that social interaction facilitated sedentary behaviour:

> In a leisure aspect though, [a reason for sitting] would be catching up with friends. So, you are sitting around, or standing around talking" (P04)

Overall, participants described positive indicators of social capital, which are known correlates of physical activity.[13, 21] However, participants also reported sitting whilst socialising. Strong sporting cultures and engagement in healthy lifestyle behaviours by others did not necessarily result in personal engagement in sport or exercise.

Crime

Thirteen participants described their local neighbourhood as safe, reporting only low-level crime. All stated that crime generally did not preclude physical activity. For example, when asked if crime prevented day or night time activity, one participant said:

> No, I wouldn't say so … you see [local residents] all the time, walking into town. It is like a village. (P02)

However, five participants reported that they would avoid activity in certain locations at night due to crime. Others avoided some activities at night, despite appraisals of low-levels of risk:

> I would quite happily walk with my roommate for example into town and back of a night time … but I wouldn't do it by myself, but I think that is more so because I grew up in Brisbane [state capital] and as soon as the sun goes down, whether you have lights or not, you do not go walking. (P10)

Overall, participants perceived local neighbourhoods to be safe. Whilst participants generally reported that crime did not preclude physical activity, walking in specific areas at night was avoided by some.

Physical Environment

The second theme represents features of the physical environment in peri-urban localities that were reported as influencing the active lifestyle behaviours of participants, or are known behavioural correlates.

Natural environment and weather

Participants described the aesthetic characteristics of their neighbourhoods, in addition to the impact of weather upon active lifestyle behaviours. Seven described the natural beauty of the local environment:

> There is a lot of natural beauty around here … visually it just captures you. (P02)

However, participants reported that the climate presented barriers to active lifestyles. Very warm and very cold temperatures negatively impacted outdoor physical activities:

> [It's] very cold in winter and very hot in summer … in winter we often get frost, and in summer it's not unusual to get up to 40 degrees [Celsius] … if it is 40 degrees, you are not going to get out and go for a walk. (P05)

Unfavourable weather also led to more sedentary behaviours:

> People don't want to get out and about because it's too cold for them. They stay home and they watch TV. (P14)

Being physically active was perceived as essential to manage large properties in peri-urban environments:

> Without being active you wouldn't be able to live here … 40 acres of lawn and garden takes a fair bit of mowing and maintaining. (P08)

However, weather dictated the scheduling of property maintenance, leading to irregular physical activity:

> I took a month off work so I could do some fencing and get some hard work into the place … while the weather and everything else is ideal … it can't be blowing and it can't be too hot. It can't be wet. You have got to have the ideal conditions to get out and do it. (P03)

Taken together, these responses indicate that local peri-urban environments are considered as aesthetically pleasing, which is likely to facilitate active lifestyles, however, weather presented barriers to physical activity and encouraged sedentary behaviour.[22, 23] Physical activity was also associated with the work required to maintain a large property, although weather impacted the regularity of physical labour.

Distance and accessibility

Participants reported that distance and accessibility negatively influenced active lifestyle behaviours. Poorer access to goods, services, and facilities influenced sedentary driving time, the ability to undertake active forms of transport, and the amount of time available for recreational physical activity:

> To go to the movies or something like that, you have got to drive for an hour pretty much … we have to drive to get to anything. (P11)

Participants also reported a lack of access to intra-city public transport in all locations except for the larger regional town of Toowoomba, leading to a reliance on sedentary travel by private vehicles:

> Well I get around by car. Everyone else that I know of gets around by car. (P10)

Despite the availability of public transport in Toowoomba, it was not utilised due to a lack of route options and electronic timetabling, and longer journey times. Regular, extended commuting for work or school was also often necessary in peri-urban communities, due to a lack of local employment and education opportunities leading to further prolonged sitting and reduced recreational time:

> We were commuting for 3 years to Brisbane and back … doing 80 kilometres each way, each day … until we could find local jobs. (P03)

More promisingly, most participants reported proximal access to sporting and recreational facilities. Five also reported that proximity to national parks and dams provided opportunities for recreational physical activity:

> A lot of people love living here for the access to some of, probably the best bush walking in Australia … I do a lot of bush walking in the national parks and things. There is also fishing. There is also a lot of bike riders. (P04)

However, consistent with the failure to participate in sport despite strong sporting cultures, several participants reported that they did not personally utilise sports and recreation services or facilities. Lack of time and not being interested in sports were cited as reasons for not utilising these facilities.

More generally, the accessibility of goods, services and facilities varied between localities, with access to aged-care facilities, health professionals, and entertainment facilities poorer in smaller towns than in larger towns. For example, a participant living in a small town said:

> I think we have, maybe 5 streets in Rifle Range … there is nothing, just streets, and … a water station. (P07)

Whereas, a resident of a larger town said:

> You could certainly buy anything that you needed in Beaudesert without leaving town. (P07)

Accessibility also differed for people living within towns and those living outside of towns. Walking for transport was typically viable for participants living within town precincts, but not for those outside of towns:

> When I first moved here I lived in town, two blocks away from where I work, so of course I just walked to and from work every day. Which was fantastic … I really loved it … but the 5 kilometres is a little bit far. (P04)

However, despite the practicability of walking, all participants residing within townships reported driving at least some of the time. Reasons included a lack of time and motivation,

the town being spread over a large area, and other impracticalities like having too many items to carry home from the store:

> I should walk a bit more and I don't … and that is through laziness … and really, really bad time management. (P09)

People living outside of towns were completely reliant on driving and travelled longer distances to access good, services, employment or education:

> You drive everywhere. You drive to work. You drive to the shop. You drive to, every bloody thing … it would be completely impractical for me to walk anywhere. (P01)

Access to sports and recreational facilities was also more limited for peri-urban residents living outside of town areas, which negatively impacted recreational physical activity.

Distance and accessibility influenced the amount of sedentary driving time, opportunities to walk for transport, time available for recreational activities, and the use of recreational facilities. The impact of accessibility in peri-urban environments differed as a function of the size of the local town, and when living within or outside of a town. Even when walking for transport was viable, or recreational facilities were near, some participants still avoided active lifestyle behaviours.

Walkability

Participants reported on features of the peri-urban environment that impacted the walkability of local neighbourhoods. Poor pedestrian-mobility infrastructure was described, particularly by participants residing outside of towns. The absence of footpaths, pedestrian crossings, street lighting, and poor road conditions restricted physical activity:

> It is [a] dirt road … We would like to do more walking … and we really can't because the only place to walk is down the middle of the road. (P01)

High speed traffic and heavy vehicles also presented significant barriers to physical activity. When asked if traffic influenced physical activity, one participant said:

> Yeah it does. Especially with the heavy transports, because they can't stop really quickly and that has been some real concerns. (P04)

However, footpaths, street lighting, parks, and cycling paths were features of newer housing estates emerging in several of the study localities:

> We are lucky to have a lot of new estates going in … they always make sure that they get a certain number of kilometres of bike paths when they approve a new estate … one of the big new estates, they are going to have a big lake there as well as grassed areas and BBQs and all sorts of things. (P04)

In summary, poor pedestrian-mobility infrastructure and dangerous traffic conditions presented barriers to active lifestyles. However, the inclusion of footpaths, street lighting, and green spaces in newly developed areas provides environments more conducive to physical activity.

Discussion

Health promotion strategies should take into account local context, aiming to reduce health inequalities by ensuring supportive environments that provide opportunities for healthy choices.[11] Peri-urban localities are unique environments, characterised by smaller populations, fewer opportunities for social interaction, employment and education, and more restricted access to goods, services, and facilities than in major cities, but are not as isolated as more remote (or 'rural') populations.[6] There is a need to improve our understanding of the context of peri-urban environments and how features of these environments impact population health and wellbeing. This study identified physical and social environmental characteristics of peri-urban Australia that potentially impact active lifestyle participation.

Participants reported features of the environment that supported active lifestyle behaviours. Communities were portrayed as socially cohesive. This is consistent with the findings of Eley and colleagues who reported neighbourliness and community spirit enhanced by the interaction of people in multiple environments (e.g. school, work, church and social) in a study conducted in six 'rural' shires of Queensland (including one classified as inner-regional).[24] Social capital has previously been associated with physical activity. Ball and colleagues identified indicators of social capital associated with greater odds of physical activity among women living in urban Melbourne, Australia.[21] Individuals reporting the highest levels of social participation were 230% more likely to report any leisure-time physical activity than those reporting the lowest levels of participation. Further, where neighbourhood levels of interpersonal trust were highest, individuals were 73% more likely to report leisure-time physical activity; and where neighbourhood cohesiveness was highest, individuals were 71% more likely to report leisure-time physical activity, compared to neighbourhoods where trust and cohesion were lowest. The broader impact of social capital upon sedentary behaviour is unclear. For example, in a systematic review of the correlates of sedentary behaviour among adults without consideration of geographic remoteness, O'Donoghue and colleagues found no evidence of overall associations between sedentary behaviour and interactions between friends, peers and colleagues. However, limited evidence of a negative association between sense of community and total sitting time was noted.[25]

Neighbourhoods were also described as attractive and safe. This is consistent with the findings of Cleland and colleagues, whereby participants in outer-regional and remote Tasmania consistently described neighbourhoods as aesthetically pleasing.[26] Favourable neighbourhood aesthetics have been positively associated with physical activity. For example, a study conducted in 17 cities across 12 countries found that favourable neighbourhood aesthetics increased the likelihood of cycling for transport by 15% and of walking for transport by 19%.[22] The impact of neighbourhood aesthetics upon physical activity may vary by geographic remoteness. A study examining the moderating influence of urban-rural status upon relationships between the perceived environment and physical activity among mid-older aged adults in Victoria, Australia found neighbourhood aesthetics was associated with physical activity among rural but not urban dwellers.[27] Neighbourhood aesthetics have also been negatively associated with sedentary behaviour. In a study conducted in urban areas of Australia, the USA and Belgium, Van Dyck et al. found that for every increase in aesthetics (i.e. one level on a 4-point scale) daily sitting decreased by 3%.[23] Associations between physical activity and crime in previous research have been mixed.[28] A longitudinal study conducted in metropolitan Perth found that increased safety from crime (i.e. by one level on a 5-point Likert scale) was associated with an 18 minute per week increase in walking.[29] However, safety from crime may impact physical activity differently in urban and rural settings. Cleland and colleagues found that perceived crime generally did not impact physical activity in outer-regional and remote Tasmania;[30] whilst personal safety was associated with physical activity among mid-older adults living in rural, but not urban, Victoria in another study.[27] The impact of perceived crime upon sedentary behaviour also appears to vary by population. Van Dyck et al. found that increased crime safety (i.e. one level increase on a 4-point scale) was associated with 3% less daily sitting among women, but not associated among the overall sample of men.[23] However, among Australian participants (male and female) increased crime safety was associated with 3% less daily sitting. In the present study, the presence of sports and recreational facilities also provided opportunities for physical activity, and sparked community interest in healthy lifestyles, while proximity to national parks facilitated recreational physical activity. This is consistent with the findings of a qualitative study conducted in rural Tasmania, whereby 60% of participants (N = 49) reported opportunities for physical activity afforded in natural settings.[26]

However, despite descriptions of 'activity supportive' features of peri-urban environments, participants self-reported largely inactive lifestyles. Driving was prevalent, even when walking was viable, and most participants did not engage in sport despite the

accessibility of sporting and recreational facilities, strong community sporting cultures, and modelling of healthy lifestyle behaviours by fellow residents. Whilst potentially beneficial, these features are insufficient in isolation to encourage widespread engagement in active lifestyles. It is possible that environmental barriers outweigh the activity-supportive characteristics of peri-urban environments. No matter how attractive or safe from crime the environment is perceived to be, or how cohesive the local community, if distance, accessibility, traffic conditions, pedestrian-mobility infrastructure and weather are unfavourable, inactive lifestyles may be difficult to change. Proximal access to destinations has been associated with increased physical activity and reduced sitting. Choi and colleagues reported consistent positive associations between the accessibility of facilities and physical activity among adults of unspecified geographic remoteness.[14] However, this relationship is unclear in rural settings. A systematic review of the effects of the built environment of physical activity among adults living in rural settings found associations between walkable destinations in only two out of five studies.[31] Associations between access to destinations and is also unclear. For example, Van Dyck et al. unexpectedly found that decreased access to services (i.e. one point on a 5-point scale) was associated with 2% less daily sitting.[23] In addition to increasing sedentary travel, the lack of usable public transport may negatively impact physical activity. In an umbrella review of environmental determinants of physical activity across the life course, Carlin and colleagues found some evidence of positive associations between the availability, accessibility and proximity of public transport with walking and cycling.[32]

Poor pedestrian mobility infrastructure creates neighbourhoods that are less 'walkable.' Built environments that are supportive of residents walking have been positively associated with walking among urban Australians, with adults from the most walkable neighbourhoods twice as likely to report 30 minutes of home-based walking, compared to those living in very car dependent areas.[33] Associations between neighbourhood walkability and sedentary behaviour have been mixed.[34] However, one study found that women living in the most walkable neighbourhoods of urban Adelaide spent 17 minutes less watching television per day compared to those in the least walkable neighbourhoods.[35] The overall impact of traffic safety upon active lifestyle behaviours is also unclear. Choi et al. found negative associations between physical activity and heavy traffic in only one of 14 reviews published between 2002 and 2016 (among adult populations without consideration of remoteness), with one review finding no correlation, and the remainder reporting inconclusive findings.[14] It is possible that factors beyond traffic volume contribute to

perceptions of dangerous traffic conditions that impact physical activity. Consistent with the present study, Cleland et al. found that high numbers of trucks on the road and high speed limits, in addition to poor visibility at night and tourist traffic negatively impacted physical activity in outer-regional and remote Tasmania.[30] It also appears that the impact of traffic safety upon physical activity differs between settings. In contrast with the findings of the present study and those of Cleland et al., Eley and colleagues noted low traffic volume in six 'rural' shires of Queensland and suggested that wide roads with low traffic still afforded opportunities for walking.[24] The impact of traffic safety upon sedentary behaviour also appears to vary by population. Van Dyck et al. found negative associations between traffic safety and sitting among women but not men; and among both men and women in urban areas of Australia, but not in Belgium or the USA.[23] Research investigating associations between weather and overall physical activity has produced mixed findings, however, there is some indication of positive associations between favourable weather and leisure-time physical activity.[32] Whereas, consistent associations have been noted between unfavourable weather and total sitting.[25]

The failure of individuals to adopt active lifestyles regardless of activity-supportive environmental features also suggests that disparities in active lifestyle participation are not exclusively attributable to environmental factors. Ecological models of physical activity and sedentary behaviour posit that behaviour is influenced by a range of variables at the individual, social, community, environmental, and policy levels, and that correlates on multiple levels interact to predict behaviour.[36, 37] Accordingly, factors at other levels are likely interacting with those identified within this study, resulting in inactive lifestyles. According to Michie and colleagues, behaviour is generated through interactions between capability, motivation, and opportunity (provided through the social and physical environment).[38] The present study focused on physical and social environmental characteristics of peri-urban environments that create or impede opportunities to undertake active lifestyles. An examination of factors such as capability and motivation was beyond the scope of the study, however, these are necessary conditions to support physically active lifestyles even in the context of ideal environmental conditions. Specifically, it is possible that those who are not active despite supportive environmental features are not motivated to be active, or are not capable. Indeed, lack of motivation was cited as a reason for driving despite the viability of walking. Further research focusing on factors such as motivation and capability may be useful to understand why peri-urban people are failing to be active, despite the presence of some activity-supportive environmental features, in addition to identifying

factors that aid people to overcome unsupportive characteristics of peri-urban settings and lead active lifestyles.

Opportunities to build more activity-supportive environments in peri-urban localities were identified through this research. The inclusion of footpaths and street lighting in more areas, and urban design features that protect pedestrians from dangerous traffic conditions could improve neighbourhood walkability.[14, 23, 33, 35] Further, the creation of physical activity spaces that minimise the impact of unfavourable weather conditions may further support active lifestyles by encouraging recreational physical activity and limiting sedentary behaviour. However, the feasibility of major changes to the built environment in peri-urban areas that are less densely populated than major cities must be acknowledged. Local government agencies are bound by limited budgets to serve smaller populations spread over greater geographic areas. The financial viability of commercial service provision in peri-urban communities is another factor which may hamper the development of activity supportive environments. For example, while enhancing the usability of existing public transport services with user-friendly journey planning, efficient timetabling and minimised journey times may encourage the use of public transport,[32] service providers are unlikely to expand operations to sparsely-populated, non-profitable areas. Resources should be prioritised to ensure maximum benefit across the population, without further widening health disparities (e.g. among those who live outside of townships in the least populated areas). Planners and policy-makers must also consider creative ways to address unmodifiable factors that impact active lifestyles in peri-urban environments, such as distance and accessibility. Despite these obvious challenges, this study has identified several characteristics of peri-urban communities which represent assets for the development of strategies to encourage active living. The strong sense of social cohesion represents a psychological resource for communities and potential avenue to supporting active lifestyle participation. Support for local sporting teams and community interest in health behaviours also represent opportunities to craft strategies to encourage increased participation. While, aesthetically pleasing and safe environments provide locations that are ideal for the conduct of physical activity.

Recruitment through social media and the conduct of interviews via Skype represent a limitation of this research, as individuals without internet access were effectively excluded from taking part. It is possible that patterns and determinants of sedentary behaviour (and physical activity) differ between internet users and non-users, which should be taken into account when interpreting the findings of this study. Additionally, 14 out of the 17 study participants were female and as such it was difficult to detect any possible variation in the

impact of contextual factors upon active lifestyles between men and women. Finally, the sample was specific to peri-urban southern Queensland, and provided an understanding of the contextual factors likely to impact active lifestyles within this region. Research in other localities will provide a more complete understanding of the range of contextual factors that contribute to inactive lifestyles across wider peri-urban contexts.

Conclusion

The social and physical environmental characteristics of peri-urban environments present unique barriers to and opportunities for active lifestyles. Barriers to the active lifestyles of peri-urban southern Queenslanders, included unfavourable weather, distance and poor accessibility, low residential density, poor pedestrian-mobility infrastructure, and dangerous traffic conditions. Activity-supportive characteristics included social cohesion, safety from crime, and favourable neighbourhood aesthetics. However, these features were insufficient to generate broad uptake of active lifestyles. Further research is recommended to understand the relative influence of each of the identified characteristics and to determine why peri-urban populations remain inactive despite activity-supportive environmental attributes, and to identify factors that may encourage active lifestyles in the face of contextual barriers, such as accessibility. Peri-urban environments may be enhanced with improvements to the built environment that enhance the walkability of local neighbourhoods, especially those that focus on minimising the impact of dangerous traffic conditions, and minimise the impact of unfavourable weather. Social cohesion, strong sporting interest, and safe and attractive physical environments represent resources that may be drawn upon when drafting policy or planning strategies designed to encourage active lifestyles in peri-urban regions.

Acknowledgements

The first Author was funded by an Australian Government Research Training Program scholarship. The authors acknowledge the generous contributions of the research participants.

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