ACTIVE COMMUTING: AN OPPORTUNITY TO FIGHT BOTH CLIMATE CHANGE AND PHYSICAL INACTIVITY

Dissertação de Mestrado

Nuno Rafael Pragana Figueiredo

Trabalho realizado sob a orientação de:

Dr. Diogo Monteiro, Escola Superior de Educação e Ciências Sociais

Dr. Filipe Rodrigues, Escola Superior de Educação e Ciências Sociais

Leiria, março 2022

Mestrado em Prescrição do Exercício e Promoção da Saúde

ESCOLA SUPERIOR DE EDUCAÇÃO E CIÊNCIAS SOCIAIS

INSTITUTO POLITÉCNICO DE LEIRIA

ACKNOWLEDGEMENTS

This has been a hard journey, and without the support of several amazing people, it would have been absolutely impossible. First of all, I would like to thank my supervisors, Dr. Diogo Monteiro and Dr. Filipe Rodrigues, for teaching me how to fly. Secondly, I am truly grateful to my entire family, for always supporting me, and for making me believe that I had wings in the first place. Last, but not least, my biggest thanks goes to my wife, Ariana. My name will be the one in the diploma, but this conquest is as yours as it is mine. Truly! It would have been impossible to get through all of this without your backing, your patience and your tremendous sacrifice. I hope this makes you as proud of me, as I am proud of you. Finally, I would like to dedicate this work to the greatest project of my life: my daughter, Matilde. This is to you, my sweet little girl. It has always been.

ABSTRACT

Global health, climate and ecological conditions cannot be dissociated, and over the last decade, the impacts of climate change on health have been profoundly felt. Additionally, physical inactivity rates have been growing over the last years, and most individuals in developed countries still rely on their cars for daily transportation. Given the well-known link between chronic diseases and sedentary lifestyles, addressing both the upward tendency of public health costs and energy consumption obtained from fossil fuels can be, possibly, one of the greatest public health opportunities over the last century. Therefore, in this work, we explore the potential of active commuting as a contemporary approach to address these global issues, considering its benefits on several indicators of health, quality of life, and well-being as well as environmental-friendly behaviors. Besides, as evidence supports the important role of the built environment in the modulation of physical activity and active commuting patterns, the main purpose of this work is to adapt and validate the Neighborhood Environment Walkability Scale- Abbreviated (NEWS-A), one of the most popular measures of perceived neighborhood environment characteristics, in a sample of Portuguese college students (NEWS-A-PT). A confirmatory factor analysis was conducted, in order to examine the factorial structure of the mentioned instrument. We also aim to explore how perceived neighborhood environment characteristics relate to physical activity and quality of life. The present study provides empirical support for the validity and reliability of the six-factor and 32-item version of the NEWS-A-PT for Portuguese college students. It also supports the assumption that perceived neighborhood environment characteristics are associated with both physical activity and quality of life indicators.

Keywords

Active commuting, climate change, confirmatory factor analysis, correlational analysis, physical activity, quality of life.

RESUMO

A saúde global, o clima e as condições ecológicas são indissociáveis e, ao longo da última década, os impactos das alterações climáticas na saúde têm-se feito sentir profundamente. Para além disso, os níveis de inatividade física têm crescido nos últimos anos, com a maioria dos indivíduos dos países desenvolvidos a dependerem dos automóveis para as deslocações diárias. Considerando a ligação bem conhecida entre as doenças crónicas e o estilo de vida sedentário, combater simultaneamente a tendência crescente dos custos em saúde pública e do consumo de energia obtido através de combustíveis fósseis é, possivelmente, uma das maiores oportunidades para a saúde do último século. Nesse sentido, no presente trabalho exploramos o potencial da mobilidade ativa enquanto estratégica de combate a estes problemas globais, considerando os seus benefícios em diversos indicadores de saúde, qualidade de vida e bem-estar, bem como para o meio ambiente. Paralelamente, sendo que as evidências sustentam o importante papel do ambiente construído na modulação dos padrões de atividade física e de mobilidade ativa, o principal objetivo do presente trabalho é adaptar e validar a Neighborhood Environment Walkability Scale-Abbreviated (NEWS-A), um dos instrumentos mais populares para avaliar as características percebidas do ambiente construído, numa amostra de alunos do ensino superior português (NEWS-A-PT). Uma análise fatorial confirmatória foi realizada, no sentido de examinar a estrutura fatorial do referido instrumento. Também nos propomos a explorar de que forma as características percebidas do ambiente construído se relacionam com a atividade física e com a qualidade de vida. O presente estudo providencia sustentação empírica para a validade e confiabilidade da versão de seis fatores e 32 itens da NEWS-A-PT para estudantes do ensino superior. Suporta, ainda, a assunção de que as características percebidas do

ambiente construído se associam a indicadores de atividade física e de qualidade de vida.

Palavras-chave

Alterações climáticas, análise correlacional, análise fatorial confirmatória, atividade física, mobilidade ativa, qualidade de vida.

LIST OF PUBLICATIONS

The present dissertation is comprised of the following papers:

- **Figueiredo, N.**, Rodrigues, F., Morouço, P., & Monteiro, D. (2021). Active Commuting: An Opportunity to Fight Both Climate Change and Physical Inactivity. *Sustainability*, *13*(8), 4290. https://doi.org/10.3390/su13084290

- **Figueiredo, N.**, Monteiro, D., & Rodrigues, F. (under review in *Journal of Transport & Health*). Examining the Neighborhood Environment Walkability Scale in a Sample of College Students: Psychometric Testing and Predictive Analysis.

GENERAL INDEX

TABLES INDEX

ABBREVIATIONS

AC – Active Commuting

AVE – Average Variation Extracted

CFA – Confirmatory Factor Analysis

CFI – Comparative Fit Index

CI – Confidence Interval

CO_2 – Carbon Dioxide

df – Degrees of Freedom

e.g. – *exempli gratia*

Gt – Gigatons

i.e. – *id est*

IBM Corp. – International Business Machines Corporation

ICC – Intraclass Correlation Coefficient

IPAQ – International Physical Activity Questionnaire

IPEN – International Physical activity and the Environment Network

IPCC – Intergovernmental Panel on Climate Change

km – Kilometer

M – Mean

MET – Metabolic Equivalent

min – Minutes

N – Sample size

NEWS – Neighborhood Environment Walkability Scale

NEWS-A – Neighborhood Environment Walkability Scale-Abbreviated

NEWS-A-PT – Neighborhood Environment Walkability Scale-Abbreviated Portuguese Version

NEWS-Youth – Neighborhood Environment Walkability Scale-Youth

OR – Odds Ratio

p – Level of significance

PA – Physical Activity

QoL – Quality of Life

RMSEA – Root Mean Square Error of Approximation

SD – Standard Deviation

SE – Standard Errors

SPSS – Statistical Package for the Social Sciences

SRMR – Standardized Root Mean Square Residual

TLI – Tucker-Lewis Index

USA – United States of America

WHO – World Health Organization

WHOQOL-Bref – World Health Organization Quality of Life Instruments-Bref

x^2 – Chi-square Test

λ – Standardized Factor Loadings

INTRODUCTION

The present dissertation was developed in the scope of the master degree in Exercise Prescription and Health Promotion, of the Polytechnic of Leiria. The main body of this work is divided in two main parts, namely: Chapter 1 - Active Commuting: An Opportunity to Fight Both Climate Change and Physical Inactivity; and Chapter 2 – Examining the Neighborhood Environment Walkability Scale in a Sample of College Students: Psychometric Testing and Predictive Analysis.

The purpose of Chapter 1 is to introduce and discuss the importance of active commuting (AC) as a common strategy to address two major global public health issues, namely: physical inactivity and climate change. In Chapter 2, since evidence supports the importance of the built environment in the modulation on physical activity (PA; Cerin et al., 2006; World Health Organization - WHO, 2006; Bauman et al., 2012; Sallis et al., 2016) and AC (Saelens et al., 2003a; Saelens et al, 2003b; Cerin et al., 2006; Yang et al., 2017; Molina-Garcia et al., 2019; Patterson et al., 2020) patterns, we proceed with the adaptation and validation of the Neighborhood Environment Walkability Scale- Abbreviated (NEWS-A; Cerin et al., 2006), one of the most used measures of perceived neighborhood environment characteristics across the world, in a sample of Portuguese college students (NEWS-A-PT). Besides, we address several inconsistencies regarding the mentioned instrument, by examining its factorial structure. A correlational analysis is also included in Chapter 2, in order to explore how perceived neighborhood environment characteristics correlate with PA and quality of life indicators.

CHAPTER 1 - ACTIVE COMMUTING: AN OPPORTUNITY TO FIGHT BOTH CLIMATE CHANGE AND PHYSICAL INACTIVITY

ABSTRACT

Global health, climate, and ecological conditions cannot be dissociated, and over the last decade, the impacts of climate change on health have been profoundly felt. In 2010, the transport sector has been responsible for the direct emission of 6.7 Gt of carbon dioxide (CO_2), and these numbers are expected to double by 2050. Additionally, physical inactivity rates have been growing over the last years, with most individuals in developed countries still relying on their cars for daily transportation, despite the unexplored potential of daily commuting in the promotion of PA. Given the well-known link between chronic diseases and sedentary lifestyles, addressing both the upward tendency of public health costs and energy consumption obtained from fossil fuels can be, possibly, one of the greatest public health opportunities over the last century. In this paper, we explore the potential of AC as a contemporary approach to address both global issues, considering its benefits on several indicators of health, quality of life, and well-being, as well as environmental-friendly behaviors.

Keywords: Environment, public health, quality of life, sustainability

BACKGROUND

THE PARADOX OF CLIMATE CHANGE ON HEALTH: PROBLEM AND OPPORTUNITY

Global health, climate, and ecological conditions cannot be dissociated (Patz, 2016). Over the last decade, the health impacts of climate change have been profoundly felt, and this tendency is likely to get worse over the next decade (Fox et al., 2019). Therefore, the global climate crisis requires a quick shift on policies and collective actions to reverse the global warming tendency (Patz, 2016).

Climate policies can influence in a positive (co-benefits) or in a negative way the achievement of social goals, such as those that relate to human health, food security, biodiversity, local environmental quality, and access to energy, among several others (Intergovernmental Panel on Climate Change - IPCC, 2014). Thus, because economic and environmental motives have not been enough to mobilize stakeholders and society's attention towards the urgency of a quick shift on climate change-related policies, and knowing that concerns on human health tend to outweigh all others, it is of most importance to start looking at this problem through a health perspective (Patz, 2016). This approach is aligned with the Parma Declaration on Environment and Health (WHO, 2010), which aims for the integration of health matters in all measures, strategies and climate change mitigation, and adaptation policies. As a matter of fact, health co-benefits of climate change mitigation policies (e.g., increased PA levels related to a change in transport behaviors) are a strong incentive to fasten those policies, since they are experienced in the short-term, as opposed to the long-term benefits of climate change mitigation per se (Watts et al., 2017).

In this regard, the relation between the current rates of chronic diseases and the increasing tendency of energy consumption obtained through the burning of fossil fuels is a tremendous opportunity to address both challenges at once (Patz, 2016). Therefore, the urging actions to fight climate change are, possibly, the greatest public health opportunity over the last century (Watts et al., 2015).

Active Commuting: A Contemporary Strategy to Fight Both Climate Change and Physical Inactivity

There is wide evidence of the effects of regular PA on several non-communicable chronic diseases, prevention of high blood pressure, improvements on mental health, quality of life, and well-being (Warburton & Bredin, 2017). Still, physical inactivity levels have been rising over the last years, reaching rates as high as 70% in some developed countries, due to changing patterns of transportation, increased use of technology and urbanization (WHO, 2018); southern European countries are showing smaller rates of PA compared to the northern ones (European Union, 2018). In order to reduce physical inactivity and sedentary behavior, the WHO (2018) has set four main strategic goals: create active societies, aiming a paradigm shift in all of society towards the benefits of regular PA; create active environments by creating supportive spaces and

places in cities and communities in which people can engage in regular PA; create active people by outlining the multiple settings in which an increase in programs and opportunities can help people to engage in regular PA; create active systems by outlining the needed investments to strengthen the systems that allow the implementation of actions to increase PA.

In this sense, walking and cycling could play an important role, since the transition to AC could go upon the WHO recommendations for daily PA, if performed with moderate intensity (4–6 Estimation of Metabolic Equivalents - METs), for at least 30 min a day (Niederseer et al., 2020). However, walking and cycling for commuting purposes have been losing relevance and popularity in many countries (WHO, 2018), with most individuals in developed countries relying on their cars for daily transportation, despite the unexplored potential of daily commuting in the promotion of PA (Niederseer et al., 2020). From an environmental perspective, the IPCC (2014) states that, in the year 2010, the transport sector accounted for 27% of final energy use, being linked to the direct emission of 6.7 Gt of carbon dioxide (CO_2). Furthermore, projections claim that these values could double by 2050, but the adoption of technical and behavioral mitigation measures regarding the transport sector, infrastructures, and urban planning (e.g., prioritizing pedestrian infrastructures and investing in transit and non-motorized services) could not only reduce energy consumption by up to 40%, but also turn into several social and economic co-benefits (IPCC, 2014). Thus, considering all these facts, investing in AC for short distances, whether through the encouragement of walking or cycling, could contribute to enhance public health (Watts et al., 2017).

Active Commuting, Health, and Quality of Life

The most significant impacts of AC on health are related to the beneficial effects of PA, especially on cardiac diseases and on elderly people (Rodrigues et al., 2020). Evidence points towards a beneficial effect of AC on body composition (Falconer et al., 2015; Henriques-Neto et al., 2020) and on cardiorespiratory fitness, as well as on several skills related to overall physical fitness, with cycling for commuting purposes seeming to have a more profound role on the latter (Henriques-Neto et al., 2020). According to a recent study developed in eight European countries, just commuting to work by bicycle with a frequency of four times a week is associated with a lower risk of being overweight ((OR = 0.74 (95%CI 0.57–0.97); te Velde et al., 2017). In a study developed

by de Hartog et al. (2010), the benefits of a transition from private cars to bicycles have been shown as being greater than the risks. The referred authors estimate that the benefits from PA inherent to this transition results in nine times more gains on years of life than the losses related to traffic accidents and to the increased inhalation of pollutants that this transition entails. In turn, Jacob et al. (2021) reported a significant increase in both physical and mental health of individuals who changed their commuting habits from cars to AC, as opposed to the worsening observed on subjects that made the reverse transition. Besides, those shifting from transit services to AC presented increased health satisfaction (Jacob et al., 2021). On the other hand, the mentioned authors noted that subjects that changed their commuting habits from AC to transit services reported a significant decrease in mental health, but, curiously, did not seem to have a significant decrease in their physical health. Jacob et al. (2021) hypothesize that this might be explained due to the PA required to commute between transit service stations. Further research is critical to examine the magnitude associated with these benefits.

Regarding the relation between AC and mental health, there is little evidence and some of it is unclear. For instance, Marques et al. (2020) stated that, besides evidence being inconsistent between AC and depression symptoms in adults, individuals could, hypothetically, benefit from increasing their PA levels through AC. In addition, evidence suggests that AC contributes to the increase of overall PA levels (Henriques-Neto et al., 2020; Larouche et al., 2014; Martin et al., 2016), whose connection to depression symptoms is well-known (Biddle, 2016). Still related to commuting, a study conducted in nine countries has shown AC to decrease psychological symptoms among teenagers who engaged in active modes of transport to school, especially by using a bicycle (Kleszczewska et al., 2020). Neumeier et al. (2020) observed a positive impact of AC on several dimensions related to the quality of life of adult workers, with the results being significant on the dimensions of physical function, general health, vitality, and mental health. Besides, evidence poses that cycling for commuting purposes might not only contribute to the decrease of work sick leave, but also to the improvement and maintenance of the well-being of working-age adults (Mytton et al., 2016).

Overall Considerations and Perspectives for Future Research

Given the urgent need to reduce CO_2 emissions, and taking the considerable role of the transport sector on those emissions into account, possible mitigation policies to reduce CO_2 must be seriously analyzed. Here lies a great opportunity to fight both climate change, consumption of energy obtained through the burning of fossil fuels, physical inactivity, sedentary lifestyles, and its associated chronic diseases by endorsing AC. Therefore, considering its well-established benefits on health and its positive effects on the mitigation of CO_2 emissions, encouraging AC programs could contribute to a healthier and more sustainable society, making a valuable contribution towards the promotion of public health. All around the world, people are being encouraged to make a transition towards AC (Jacob et al., 2021). To our knowledge, literature on AC is still scarce, and the number of people engaging in a more active way to commute is still unknown. Considering the decrease in popularity of AC mentioned above, and in order to reduce fossil fuel consumption and to increase the levels of PA among an increasingly more sedentary society, we suggest more research on why people choose to commute the way they do, as there seem to be paramount questions that need to be addressed.

Due to their research interest, universities, in particular, could provide a good framework to further assess, test, and implement policies regarding urban sustainable transport (Engelen et al., 2019). With AC programs being positively linked to overall PA patterns among students of several ages (Larouche et al, 2014; Martin et al., 2016), we recommend that both researchers and policymakers consider this population as a main intervention target by encouraging the engagement on a more sustainable way to commute since an early age. Additionally, considering the important role of the built and natural environment on the shaping of PA patterns (Cerin et al., 2006), it is of most importance to look at our cities through the eyes of people that actually commute in it, to understand whether our cities are ready or not to support and to encourage AC programs. Future research investigating a possible causal association between AC and overall PA is needed, incorporating objective measures of environmental costs, and to gain a clearer understanding of whether taking up AC results in an increase in overall PA and a decrease in overall energy (e.g., fossil fuel) use.

Strategies for Active Commuting As a Mean to Promote Physical Activity

Taking the previously mentioned high rates of physical inactivity and the relevant role of AC on health and quality of life into account, we consider that a set of multiple strategies to promote a shift towards AC is needed. In order to overcome possible barriers to the adoption of AC, and to increase awareness about the importance of PA, we suggest some examples of possible strategies:

• When distance from home to work/school is a problem, people should be encouraged to park their cars within a 15 min walking or cycling distance from their work/school;

• For people using transit services, dropping off a few stations earlier could be an option to increase their PA levels;

• Stakeholders could implement thematic days, such as “walk-to-work day”, or “cycle-to-work day”;

• Policymakers should consider offering bicycle-sharing systems, especially nearby peripheral parking lots and other pivotal urban areas, and investing in bicycle lanes and pedestrian access.

CHAPTER 2 – EXAMINING THE NEIGHBORHOOD ENVIRONMENT WALKABILITY SCALE IN A SAMPLE OF COLLEGE STUDENTS: PSYCHOMETRIC TESTING AND PREDICTIVE ANALYSIS

ABSTRACT

Despite the known benefits of PA, physical inactivity levels have grown over the last years. Since most individuals in developed countries rely on their private cars for transportation, the promotion of active modes of transport, such as walking or cycling, is a possible and viable strategy to encourage active living among workers and students. Evidence supports the important role of the built environment in the modulation of PA and AC patterns. However, the role of the built environment in quality of life is less clear. The main purpose of the present study is to adapt and validate the NEWS-A, one of the most popular measures of perceived neighborhood environment, in a sample of Portuguese college students (NEWS-A-PT). A confirmatory factor analysis (CFA) was conducted, in order to examine the factorial structure of the mentioned instrument. We also aim to explore how perceived neighborhood environment characteristics relate to PA and quality of life. The present study provides empirical support for the validity and reliability of the six-factor and 32-item version of the NEWS-A-PT for Portuguese college students. It also supports the assumption that perceived neighborhood environment characteristics are associated with both PA and quality of life.

Keywords: active commuting, confirmatory analysis, correlational analysis, physical activity, quality of life

BACKGROUND

Evidence points that regular PA has multiple benefits, being associated with a decreased risk of all-cause mortality, cancer mortality, and several chronic conditions, such as cardiovascular disease, type II diabetes, high blood pressure, breast cancer, colon cancer, gestational diabetes, gallstone disease, ischemic heart disease, and ischemic

stroke (Warburton & Bredin, 2017). However, regardless all the known benefits of PA, with the acquisition of new transportation behaviors, increased use of technology and increased urbanization, physical inactivity levels have grown over the last years in developed countries, reaching rates as high as 70% (WHO, 2018).

According to the most recent WHO guidelines on PA and sedentary behavior (Bull et al., 2020), all adults benefit from regular PA, with many of those benefits being observed within average weekly volumes of 150-300 min of moderate intensity or 75-150 min of vigorous intensity, or a combination of both types (American College of Sports Medicine, 2021). In this sense, PA should be integrated into the settings in which people live (WHO, 2018), since all the activity at work, leisure, home or during transportation contributes on reaching the recommended levels of PA (Bull et al., 2020). Hence, all adults should decrease the amount of time spent on sedentary behavior (Bull et al., 2020; Santos et al., 2022). This seems to be particularly relevant among college students, since there is evidence that most of them are unaware of PA recommendations for adults (Martins et al., 2019). Besides, the transition to college is known as being a major event in life which is associated with a decrease in PA levels (Engberg et al., 2012).

Active Commuting and Physical Activity

In developed countries, most individuals rely on their private cars for transportation, despite the potential of daily commuting in the promotion of PA (Niederseer et al., 2020). In this regard, the promotion of active modes of transport, such as walking or cycling (i.e., AC) has been receiving growing attention as a possible and viable strategy to encourage active living among workers and students (Shephard, 2008), with previous studies suggesting that AC can contribute to the increase of overall PA levels (Henriques-Neto et al., 2020; Larouche et al., 2014; Martin et al., 2016). Niederseer et al. (2020) point that, by engaging in AC for 30 min a day, with moderate intensity, people could reach the recommended levels of daily PA. The importance of AC is also acknowledged by the WHO (2018), which contemplates it as one of the pathways to help attain several Sustainable Development Goals, namely: decent work and economic growth; industry, innovation and infrastructure; sustainable cities and communities; climate action; peace, justice and strong institutions; and good health and well-being.

Benefits of Active Commuting on Health

The benefits of AC on health are supported by current literature. AC has been linked to a lower risk of all-cause mortality, diabetes (Dinu et al., 2019) and cardiovascular disease (Dinu et al., 2019; Eriksson et al., 2020). Accordingly, Henriques-Neto et al. (2020) point that a positive relationship has been found between AC and several attributes related to physical, as well as cardiorespiratory, fitness. Evidence also supports that AC has a positive effect on body composition (Falconer et al., 2015; Henriques-Neto et al., 2020), with active commuters having a lower risk of being overweight, compared to passive commuters (te Velde et al., 2017). In addition to its benefits on physical health, AC has also been linked to mental health benefits (Jacob et al., 2021; Kleszczewska et al. 2020).

Furthermore, Mytton et al. (2016) found that AC is associated with a reduction in sickness absence among adult workers, as well as an increase in self-reported well-being. Likewise, one study conducted by Neumeier et al. (2020) supports the important role of AC on quality of life. The mentioned authors (Neumeier et al., 2020) found that adult workers who actively commute to work report a greater quality of life, compared to passive commuters, with the dimensions of general health, physical function, mental health, and vitality displaying statistically significant differences between groups.

The Role of the Built Environment on Physical Activity, Active Commuting and Quality of Life

Over the last years, the popularity of AC has been decreasing in many countries (WHO, 2018). In this sense, it is important to understand what may lie behind people´s commuting choices (Figueiredo et al., 2021). Evidence points that both natural and built environments have an important role in the modulation of PA (Cerin et al., 2006), and the design elements of the built environment are known to either encourage or discourage active living (WHO, 2006), having the potential to contribute nearly 90 min/week to overall PA (Sallis et al., 2016). One study conducted by Bauman et al. (2012) points that overall PA is positively correlated with environmental features, such as the transportation environment, aesthetics, and the existence of recreation facilities and locations. Accordingly, one study developed by Sallis et al. (2016) across several countries, found positive and significant associations between PA levels and

environmental attributes, such as residential density, access to public transports, and access to parks.

Past research also supports the fact that the physical environment seems to influence AC, since it has been associated with walking (Saelens et al., 2003a; Saelens et al., 2003b) and cycling for transport (Saelens et al., 2003b). Accordingly, Cerin et al. (2006) found positive correlations between AC and built environment attributes. In a recent study, Patterson et al. (2020) also reported an association between supportive physical environment factors and AC, particularly among men. In line with these findings, in a longitudinal study developed among adults, Yang et al. (2017) found that supportive environmental features (e.g., streetlights; greater density of employment destinations; shorter distance (<10 km) between home and work), not only predict uptake of AC, but are also associated with its maintenance. There is also evidence of the importance of the built environment regarding AC to school among college students. For instance, Molina-García et al. (2019) found that students living in areas with greater walkability reported more frequent AC trips to school compared to their counterparts who lived in neighborhoods with lower walkability.

Regarding the role of the built environment on quality of life, evidence is still scarce, and some of it conflicting. For instance, Sallis et al. (2009) found no positive associations between quality of life and neighborhood walkability. In turn, Gao et al. (2016) reported significant associations between perceived neighborhood attributes and both mental and physical well-being indicators. Specifically, Gao et al. (2016) found that mental well-being was positively and significantly associated with increased walkability, diversity of resources, ease of access, safety, aesthetics, and street connectivity. Gao et al. (2016) also found physical well-being to be associated with diversity of resources, ease of access, and aesthetics. Accordingly, Sarmiento et al. (2010) found positive associations between quality of life indicators and perceived built environment attributes, such as land use heterogeneity and access to parks. Taking these inconsistencies in the literature into account, we consider that it is of upmost relevance to further analyze how the built environment might relate to quality of life in other populations, with different cultural settings, such as students.

MEASURING BUILT ENVIRONMENT ATTRIBUTES

According to Cerin et al. (2006) there are objective (i.e. geographic information systems) and subjective means of measuring attributes of the built environment. Regarding subjective means, there are several validated measures in the literature, such as the Physical Activity Neighborhood Environment Survey (Sallis et al., 2010), the Neighborhood Environment Walkability Scale – NEWS (Saelens, et al., 2003a), and its abbreviated form – NEWS-A (Cerin et al., 2006). The NEWS and the NEWS-A are currently the most popular across the world (Cerin et al., 2013). The NEWS (Saelens et al., 2003a) is a valid self-report measure of neighborhood environment characteristics, and includes 68 items grouped into eight subscales: Residential density (i.e., frequency of several types of residences, such as single-family detached homes or 1-3 stories condos); Land use mix-diversity (i.e., walking proximity to non residential land uses, such as restaurants or stores); Land use mix-access (i.e., access to non residential land uses); Street connectivity (i.e., existence of gridlike street patterns, with short block lengths and few cul-de-sacs); Walking/cycling facilities (i.e., sidewalks and pedestrian/bike trails); Aesthetics (i.e., presence of attractive natural sights and/or attractive buildings); Traffic safety (i.e., slow speed traffic on nearby streets); and Crime safety (i.e., low crime rate). This instrument has a high level of consistency, with most of its subscales showing a good test-retest reliability with scores above 0.75 (Saelens et al., 2003a). Considering that the NEWS is a long questionnaire, Cerin et al. (2006) developed the NEWS-Abbreviated (NEWS-A), a shorter version of the NEWS, maintaining the structure of eight subscales, but reducing the number of items down to 54. In order to select which items would be removed to create the abbreviated version, Cerin et al. (2006) identified overlapping items, and kept the ones with the best psychometric properties (i.e., better criterion validity; contribution of a specific item to the criterion validity of its factor; magnitude of Intraclass Correlation Coefficient (ICC); test-retest reliability; and higher factor loadings and significant loadings in the respective factors). The authors also excluded other items considered to have low criterion validity. Hence, for the development of the NEWS-A, the following items have been removed: "*I can do most of my shopping at local stores.*" – Land use mix-access; "*There are walkways in my neighborhood that connect cul-de-sacs to streets, trails, or other cul-de-sacs.*" – Street connectivity; "*There are many four-way intersections in my neighborhood.*" – Street connectivity; "*The sidewalks in my*

neighborhood are well maintained." – Walking/cycling facilities; "*There are bicycle or pedestrian trails in or near my neighborhood that are easy to get to.*" – Walking/cycling facilities; "*It is safe to ride a bike in or near my neighborhood.*" – Walking/cycling facilities; "*Trees give shade for the sidewalks in my neighborhood*." – Aesthetics; "*My neighborhood is generally free from litter.*" – Aesthetics; "*There is so much traffic along the street I live on that it makes it difficult or unpleasant to walk in my neighborhood.*" – Traffic safety; "*The speed of traffic on the street I live on is usually slow.*" – Traffic safety; "*The crosswalks in my neighborhood help walkers feel safe crossing busy streets.*" – Traffic safety; "*When walking in my neighborhood there are a lot of exhaust fumes.*" – Traffic safety; "*I see and speak to other people when I am walking in my neighborhood.*" – Crime safety; and "*My neighborhood is safe enough so that I would let a 10-year-old boy walk around my block alone in the daytime.*" – Crime safety.

To develop the original version of the NEWS, Saelens et al. (2003a) recruited 107 participants from two nonadjacent neighborhoods, previously categorized as having high and low walkability. Later, in order to develop and validate the NEWS-A, Cerin et al. (2006) extended the sample size (N=1286), which they considered to be small in the original NEWS study, and involved a wider neighborhood variability, since the previous work from Saelens et al. (2003a) only included two pre-selected neighborhoods. Still, in a later study, Cerin et al. (2009) aimed to cross-validate both the original NEWS and the NEWS-A in a different location and population within the USA, bringing into account that the previous studies have been driven in settings with limited environmental variability. Although both the NEWS and the NEWS-A questionnaires have been shown to have adequate levels of factorial and criterion validity, Cerin et al. (2006) point that the NEWS-A showed better fit to the data and better criterion validity compared to the original version of the NEWS.

PRESENT RESEARCH

Taking into account that the original NEWS subscales were not based on an exploratory factor analyses (Saelens et al., 2003a), Cerin et al. (2006) also decided to assess the factorial validity of the *a priori* subscales of both the NEWS and the NEWS-A. However, Cerin et al. (2006) did not consider appropriate to include the first two subscales (i.e., Residential density; Land use mix-diversity) in a CFA, due do their

response format (i.e., Residential density subscale items are first coded form 1 to 5, and are then calculated based upon the average density attributed to the various residence types; Land use mix-diversity is assessed according to the walking proximity of several stores/facilities, and its responses range from 1-5 min walking distance to >30 min walking distance, and the responses are then coded from 1 to 5; All the other subscales are rated according to a four-point Likert scale). In this sense, ultimately, the responses to the items related to Residential density and the Land use mix-diversity subscales are also coded on a Likert-type scale, but using a five-point scale instead of a four-point scale. Therefore, we consider that these latent factors should also be included in a factor analysis. To the best of our knowledge, none of the studies which aimed to validate the factorial structure of the NEWS-A included the Residential density and Land use mix-diversity subscales in their analysis, since the procedure described above was followed by other studies which conducted a CFA on the NEWS/NEWS-A (Cerin et al., 2009; Cerin et al. 2013), and the NEWS-Youth (Cerin et al., 2019). The summary of goodness-of-fit indexes for the tested models of the mentioned instruments across several countries can be consulted in Table 1.

Table 1. Summary of goodness-of-fit indexes for the tested models

Authors	Model	Scale	Country	$\chi 2$	df	CFI	TLI	SRMR	RMSEA	CI
Cerin et al. (2006)	Six-correlated factor: a priori	NEWS	USA	5701.5*	1373	.82	.81	.074	.050	.048, .051
	Six-correlated factor: re-specified	NEWS	USA	3400.2*	1135	.92	.92	.063	.040	.038, .041
	Six-correlated factor: based[¥]	NEWS-A	USA	1052.9*	442	.97	.97	.052	.033	.030, .035
	Six-correlated factor: re-specified	NEWS-A	USA	1020.7*	445	.97	.97	.067	.032	.029, .034
Cerin et al. (2009)	Six-correlated factor: a priori	NEWS	USA	2881*	1135	.92	.91	.066	.038	.035, .041
	Six-correlated factor: re-specified	NEWS	USA	2801*	1135	.92	.92	.070	.036	.033, .040
	Six-correlated factor: a priori	NEWS-A	USA	1099*	445	.96	.95	.113	.030	.024, .035
	Six-correlated factor: re-specified	NEWS-A	USA	1066*	445	.97	.96	.076	.026	.020, .032
Cerin et al. (2013)	Eight-correlated factor: a priori[‡]	NEWS/NEWS-A mix	Australia	593[†]	161	.934	-	.040	.041	.037, .044
	Eight-correlated factor: final[‡]	NEWS/NEWS-A mix	Australia	534[†]	139	.934	-	.044	.042	.039, .046
	Eight-correlated factor: a priori[‡]	NEWS/NEWS-A mix	Belgium	914[†]	202	.856	-	.058	.056	.052, .059
	Eight-correlated factor: final[‡]	NEWS/NEWS-A mix	Belgium	462[†]	141	.907	-	.055	.045	.040, .049
	Eight-correlated factor: a priori[‡]	NEWS/NEWS-A mix	Brazil	340[†]	181	.906	-	.055	.046	.040, .056
	Eight-correlated factor: final[‡]	NEWS/NEWS-A mix	Brazil	249[†]	155	.927	-	.053	.040	.031, .049
	Eight-correlated factor: a priori[‡]	NEWS/NEWS-A mix	Colombia	351[†]	202	.928	-	.068	.044	.036, .051

Eight-correlated factor: final‡	NEWS/NEWS-A mix	Colombia	262†	175	.956	-	.065	.036	.026, .044
Eight-correlated factor: a priori‡	NEWS/NEWS-A mix	Czech Republic	453†	201	.897	-	.066	.053	.046, .059
Eight-correlated factor: final‡	NEWS/NEWS-A mix	Czech Republic	357†	171	.915	-	.060	.049	.042, .056
Eight-correlated factor: a priori‡	NEWS/NEWS-A mix	Denmark	491†	202	.901	-	.052	.048	.043, .053
Eight-correlated factor: final‡	NEWS/NEWS-A mix	Denmark	316†	179	.948	-	.047	.035	.029, .041
Eight-correlated factor: a priori‡	NEWS/NEWS-A mix	Hong Kong	247†	142	.952	-	.044	.041	.032, .049
Eight-correlated factor: final‡	NEWS/NEWS-A mix	Hong Kong	248†	144	.953	-	.045	.040	.032, .048
Eight-correlated factor: a priori‡	NEWS/NEWS-A mix	Mexico	630†	202	.862	-	.068	.056	.050, .062
Eight-correlated factor: final‡	NEWS/NEWS-A mix	Mexico	369†	177	.915	-	.065	.046	.039, .053
Eight-correlated factor: a priori‡	NEWS-A	New Zealand	722†	202	.896	-	.045	.043	.040, .047
Eight-correlated factor: final‡	NEWS-A	New Zealand	501†	173	.930	-	.042	.037	.033, .041
Eight-correlated factor: a priori‡	NEWS/NEWS-A mix	Spain	716†	202	.876	-	.065	.057	.052, .061

	Eight-correlated factor: final‡	NEWS/NEWS-A mix	Spain	512†	174	.911	-	.060	.050	.045, .055
	Eight-correlated factor: a priori‡	NEWS/NEWS-A mix	UK	322†	161	.933	-	.044	.036	.030, .042
	Eight-correlated factor: final‡	NEWS/NEWS-A mix	UK	234†	137	.956	-	.045	.031	.024, .037
	Eight-correlated factor: a priori‡	NEWS	USA	581†	202	.940	-	.046	.042	.039, .046
	Eight-correlated factor: final‡	NEWS	USA	480†	173	.951	-	.046	.041	.036, .045
Cerin et al. (2019)	Six-correlated factor: a priori	NEWS-Y	Australia	478†	194	.864	-	.078	.082	.073, .091
	Six-correlated factor: final	NEWS-Y	Australia	192†	124	.958	-	.068	.050	.036, .064
	Six-correlated factor: a priori	NEWS-Y	Belgium	612†	194	.860	-	.100	.094	.085, .102
	Six-correlated factor: final	NEWS-Y	Belgium	204†	125	.961	-	.078	.052	.039, .064
	Six-correlated factor: a priori	NEWS-Y	Brazil	442†	194	.844	-	.056	.051	.045, .057
	Six-correlated factor: final	NEWS-Y	Brazil	209†	126	.935	-	.047	.037	.028, .045
	Six-correlated factor: a priori	NEWS-Y	Hong Kong	1268†	194	.905	-	.067	.066	.062, .069
	Six-correlated factor: final	NEWS-Y	Hong Kong	624†	128	.944	-	.056	.055	.051, .059
	Six-correlated factor: a priori	NEWS-Y	India	441†	194	.869	-	.065	.066	.057, .073
	Six-correlated factor: final	NEWS-Y	India	180†	129	.964	-	.061	.037	.023, .049
	Six-correlated factor: a priori	NEWS-Y	Malaysia	493†	194	.889	-	.084	.068	.061, .076
	Six-correlated factor: final	NEWS-Y	Malaysia	239†	125	.947	-	.070	.053	.042, .063
	Six-correlated factor: a priori	NEWS-Y	New Zealand	423†	194	.877	-	.072	.065	.058, .073

	Six-correlated factor: final	NEWS-Y	New Zealand	240†	128	.914	-	.057	.048	.038, .057
	Six-correlated factor: a priori	NEWS-Y	Nigeria	432†	194	.870	-	.078	.071	.062, .080
	Six-correlated factor: final	NEWS-Y	Nigeria	211†	133	.951	-	.070	.049	.036, .061
	Six-correlated factor: a priori	NEWS-Y	Spain	527†	194	.899	-	.064	.069	.063, .075
	Six-correlated factor: final	NEWS-Y	Spain	308†	126	.948	-	.049	.056	.048, .064
	Six-correlated factor: a priori	NEWS-Y	USA	933†	194	.897	-	.067	.064	.060, .068
	Six-correlated factor: final	NEWS-Y	USA	368†	129	.955	-	.065	.045	.039, .050

Notes: $\chi 2$ = qui-square test; df = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker Lewis Index; SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation; CI= Confidence Interval; * *p* level not specified; ¥Based on the re-specified model of the NEWS; ‡six factors plus two single items common for all countries; † $p < .001$ level

Cerin et al. (2006) also found that the two measurement models for the NEWS-A (individual level and blockgroup level), although similar, were not equivalent, since some attributes did not group in the same manner. The referred authors identified six individual level factors (i.e., Land use mix-access; Street connectivity; Infrastructure and safety for walking; Aesthetics; Traffic hazards; Crime) and five blockgroup level factors (i.e. Land use mix-access and infrastructure for walking; Physical obstacles to walking/cycling; Aesthetics and friendliness; Traffic hazards; Crime). However, this blockgroup level factorial structure was later refuted by Cerin et al. (2009), with their study having identified a sixth factor in this blockgroup level model (i.e., Physical obstacles to walking). Therefore, Cerin et al. (2009) recommend the use of the individual level measurement model, instead of the blockgroup one.

In order to collect data regarding the built environment, the International Physical activity and the Environment Network (IPEN) Adult has been using either the NEWS or the NEWS-A questionnaire (Kerr et al., 2013). To our knowledge, Portugal lacks self-report measures of the neighborhood environment. During our research, we found a Portuguese study from 2014 (Paisana-Morais et al., 2014) which validated a scale, based on the Australian version of the NEWS (Cerin et al., 2008), to evaluate the perceived neighborhood walkability among elderly citizens. As far as the NEWS is concerned, we found only one study (Cerin et al., 2019) which mentions the existence of a Portuguese version for the youth, but little information is provided about this version, as the Portuguese sample was too small and, therefore, this NEWS-Youth version was excluded from the study´s CFA. As far as the adult Portuguese population is concerned, we could not find any specific self-report measure regarding the characteristics of the neighborhood environment. Still, evidence points that there is a need to target young adults, such as post-secondary students, in health promotion campaigns, focusing the importance of engaging in more healthy lifestyles, including the ones which relate to PA (Kwan et al., 2013). Besides, as mentioned above, there seems to be a general unawareness of the recommended levels of PA among college students (Martins et al., 2019). Thus, taking the worrying health-related lifestyles among college students into account (Aceijas et al., 2017), with individuals reporting lack of time as being one of the most common reasons not to engage in PA (Ashton et al., 2017), AC might be a viable way to reach daily PA recommended levels (Bopp et al., 2012).

In this context, considering the important role of the built environment in the modulation of PA (Cerin et al., 2006; WHO, 2006; Bauman et al., 2012; Sallis et al., 2016) and AC (Saelens et al., 2003a; Saelens et al, 2003b; Cerin et al., 2006; Yang et al., 2017; Molina-Garcia et al., 2019; Patterson et al., 2020), and taking into account the fact that the NEWS-A has not been validated in Portugal, the main purpose of the present study is to adapt and validate the NEWS-A to Portuguese college students. Furthermore, as previous studies regarding the NEWS-A (Cerin et al., 2006; Cerin et al., 2009; Cerin et al., 2013) did not include the Residential density and the Land use mix-diversity subscales in their CFA, we also aim to include the mentioned subscales in our analysis. Besides, considering that evidence of the associations between the built environment and quality of life is still scarce, the secondary goal of the present study is to provide further evidence on this matter, by examining how perceived neighborhood environment attributes relate, not only to PA, but also to quality of life constructs. We consider this to be important, since it enhances a more comprehensive perspective on how these variables may correlate to one another, which could provide valuable information to design future health interventions regarding the promotion of PA, AC and quality of life.

METHODS

PARTICIPANTS

In order to develop the present study, the following inclusion criteria were considered: a) Being between 18 and 65 years-old; b) Attending college; c) Being fluent in Portuguese; d) Accepting the informed consent terms; and e) Being open to voluntarily participate in the study. Subjects not fulfilling all the inclusion terms were excluded from the study. A total of 507 college students (female= 346; male =161), aged between 18 and 65 years (M=25.05; SD=8.76) were recruited. As far as their attended educational level is concerned, one (0.2%) student was attending a specialization course, 35 students (6.9%) a short cycle program degree, 325 (64.1%) a bachelors´ degree, 10 (2%) a post-graduate degree, 134 (26,4%) a masters´ degree, and two (0.4%) a doctoral degree. Regarding their study field, 17 (3.4%) students were attending tourism courses, 22 (4.3%) technology courses, 26 (5.1%) arts/design courses, 30 (5.9%) social sciences courses, 30 (5.9%) life sciences courses, 32 (6.3%) education courses, 71 (14%) sports sciences courses, 79 (15.6%) engineering courses, 86 (17%)

health sciences courses, and 112 (22.1%) management/economics courses. Concerning their usual commuting mode, 146 (28.8%) students were classified as active commuters (i.e., walking, cycling), 253 (49.9%) as passive commuters (i.e., car, motorcycle) and 108 (21.3%) as mixed commuters (i.e., public transport and walking).

The A-priori sample size calculator for CFA (Soper, 2022) was used to calculate the minimum required participants for this study. The following inputs were used: anticipated effect size = 0.03; desired statistical power =0.95; probability level = 0.05, number of latent variables = 8, number of observed variables = 54. The results suggested a minimum of approximately 341 participants, which provided support that the current sample size is acceptable.

PROCEDURES: TRANSLATION OF THE NEWS-A

Regarding the translation and adaptation of the NEWS-A (Cerin et al. 2006) to Portuguese, after obtaining permission from the original authors, the procedures were based on the recommendations of Brislin (1980). Therefore, the following steps have been followed: (a) Preliminary translation of the questionnaire; (b) Submission to a first evaluation panel, in which the initial Portuguese version was reviewed by specialists from different fields of scientific expertise; (c) Submission to a second evaluation panel, independent from the first panel; (d) Administration of the questionnaire to 30-40 college students to evaluate the temporal reliability; and (e) Continuous revision of the questionnaire, according to eventual participants´ commentaries/suggestions regarding Portuguese language interpretation issues. The initial and final Portuguese versions of the NEWS-A (NEWS-A PT) can be consulted in Appendices 1 and 2, respectively. Concerning the test-retest reliability of the NEWS-A-PT, according to probability theory, a sample size of N = 30 is considered acceptable and recommended for this type of test (Hair et al., 2019). The recommended time between survey administrations ranges from 1 to 4 weeks (Banville et al., 2000; Vallerand, 1989). Accordingly, in the present study, 32 voluntary college students were asked to fill the questionnaire twice, with a 2-4 weeks gap between the two administrations.

PROCEDURES: DATA COLLECTION

Data collection was driven according to the Declaration of Helsinki, and the Institutional Research Ethics Committee provided its approval for the study

implementation (CE/IPLEIRIA/18/2021). The present study was cross-sectional in design, and several institutional deans/headmasters were contacted in order to spread online surveys among their students, using their internal mailing lists. A total of 20 institutions were reached, and 12 (60%) divulged the survey, four (20%) did not reply, and four (20%) refused to collaborate due to institutional formalities constraints. Before the data collection, potential participants were informed about the main goals of the study, the estimated time to complete the survey (about 12 minutes) and were ensured that all ethical procedures were respected. Prior to completing the questionnaires, participants had to fill a checkbox, ensuring that they understood the study purposes, and that they accepted to participate. Participants were thanked their contribution, but no compensation was provided.

MEASURES

In order to evaluate the perceived neighborhood environment, participants completed the NEWS-A (Cerin et al., 2006), translated into Portuguese (as described above). The original version (Cerin et al., 2006) includes 54 items, grouped into six latent factors: Land use mix-access (e.g., "*There are many places to go within walking distance at my home*."); Street connectivity (e.g., *There are many alternative routes for getting from place to place in my neighborhood*."); Infrastructure and safety for walking (e.g., *"There are sidewalks on most of the streets in my neighborhood.*"); Aesthetics (e.g., "*There are trees along the streets in my neighborhood*."); Traffic hazards (e.g., "*Most drivers exceed the posted limits while driving in my neighborhood.*"); Crime (e.g., "*There is a high crime rate in my neighborhood.*"). The instrument also includes two multi-item subscales, namely: Residential density (e.g., "*How common are apartments or condos 4-6 stories in your immediate neighborhood?*"); and Land use mix-diversity (e.g., *"About how long would it take to get from your home to the nearest businesses or facilities listed below if you walked to them? Fruit/vegetable market.").* Additionally, the NEWS-A also encompasses four single item subscales: Lack of parking (i.e., "P*arking is difficult in local shopping areas.*"); Lack of cul-de-sacs (i.e., "*The streets in my neighborhood do not have many cul-de-sacs."*); Hilliness (i.e., "*The streets in my neighborhood are hilly, making my neighborhood difficult to walk in.*"); and Physical barriers (i.e., *"There are major barriers to walking in my neighborhood that make it*

hard to get from place to place (for example, freeways, railway lines, rivers, canyons, hillsides).").

To assess the levels of PA, the translated version of the Short Form of the International Physical Activity Questionnaire (IPAQ) was used (Matsudo et al., 2001). The referred instrument includes eight questions: two for vigorous PA; two for moderate PA; two for walking PA; and two regarding sitting time. However, in the present study, information about sitting time was not used. The IPAQ short form allows to calculate separate scores for walking PA (i.e., Walking MET-minutes/week= 3.3*walking minutes*walking days), moderate PA (i.e., Moderate MET-minutes/week= 4*moderate activity minutes*moderate activity days), and vigorous PA (i.e., Vigorous MET-minutes/week= 8*vigorous activity minutes*vigorous activity days) and, by computing the duration (in minutes) and frequency (in days) of the three different types of PA (i.e., Total physical activity MET-minutes/week= sum of Walking + Moderate + Vigorous MET-minutes/week scores), it provides a total score for self-reported PA (IPAQ Group, 2005).

Regarding the assessment of quality of life, the Portuguese version of the World Health Organization Quality of Life Instruments- Bref (WHOQOL-Bref; Vaz Serra et al., 2006) was used. It consists in a 26-item instrument, organized into four distinct domains, namely: Physical health (e.g., *"To what extent do you feel that physical pain prevents you from doing what you need to do?"*); Psychological (e.g., *"How much do you enjoy life?"*); Social relationships (e.g., *"How satisfied are you with your personal relationships?"*); and Environment (e.g., *"How safe do you feel in your daily life?"*). Additionally, the referred instrument also has two questions included in the facet "Overall quality of Life and General Health" (i.e., *"How would you rate your quality of life?"*; and "*How satisfied are you with your health?"*).

Statistical Analysis

Test-Retest Analysis

Regarding the test-retest reliability, the correlations from responses given in the two NEWS-A-PT administrations were calculated in SPSS (IBM Corp., 2020) for each item using the Intraclass Correlation Coefficient (ICC), and results > 0.70 were considered acceptable (Bartko, 1966).

FACTOR ANALYSIS

Analyses were performed in Mplus 7.4 (Muthén & Muthén, 2010). As previous empirical studies (Cerin et al., 2006; Cerin et al., 2009) gave support for a 54-item measurement model, we tested the correlated nine-factor model (six *a priori* factors, plus the Residential density and Land use mix-diversity subscales. The single-item subscales were grouped into one factor) using CFA. We considered the Robust Maximum Likelihood estimator to correct any non-normality bias. In the factor analysis, items were allowed to load on their predefined factors, suppressing cross-loadings on unintended factors. No missing data at the item level was found due to how the questionnaire was built. Due to the over-sensitivity of the chi-square statistics on large samples and the model complexity (Hair et al., 2019), we considered several common goodness-of-fit indices to assess model fit, namely: Tucker-Lewis Index (TLI); Comparative Fit Index (CFI); Root Mean Square Error of Approximation (RMSEA) and its respective Confidence Interval at 90% (CI 90%); and Standardized Root Mean Residual (SRMR). For CFI and TLI, values ≥ 0.90 are typically interpreted to reflect adequate fit and for SRMR and RMSEA, values of ≤ 0.080 are indicative of adequate fit to the data (Hair et al., 2019; Marsh et al., 2004). Nonetheless, chi-square statistics and degrees of freedom will be reported for transparency.

Analyses of the individual items should display significant loadings on the target factor, with factor loadings greater than 0.50 and significant ($p < 0.05$), and they should explain at least 25% of the variance (Hair et al., 2019). For the assessment of internal consistency, composite reliability coefficients were calculated for the subscale scores, and values ≥ 0.70 were considered as acceptable (Raykov, 2016).

The Average Variance Extracted (AVE) and the comparison between squared root of the AVE and squared correlations were used to investigate convergent and discriminant validity, respectively. AVE is an established approach to test convergent validity (Hair et al., 2019) and scores above 0.50 are deemed to be acceptable. Constructs are identified as distinct when the square root of the AVE value is larger than the correlation between the two constructs displaying discriminant validity (Hair et al., 2019).

CORRELATIONAL ANALYSIS

In order to correlate PA, perceived neighborhood environment and quality of life, Pearson correlations were calculated in SPSS (IBM Corp., 2020) considering levels of PA, neighborhood environment constructs, and quality of life factors. Significance levels were set at $p < 0.05$.

RESULTS

TEST-RETEST ANALYSIS

As far as the test-retest reliability is concerned, results are shown in Table 2. Regarding the items which remained in the final 32-item version of the NEWS-A-PT (see later), all but B13, F2, F3, H1 and H2 showed acceptable results (> 0.70). Therefore, in general, the NEWS-A-PT displayed acceptable levels of temporal reliability.

Table 2. Test-retest reliability

Factors	**ICC**
Residential density	
Item 1	.70***
Item 2	.84***
Item 3	.75***
Item 4	.87***
Item 5	.94***
Item 6	.92***
Land use mix-diversity	
Item 1	.88***
Item 2	.84***
Item 3	.80***
Item 4	.76***
Item 5	.78***
Item 6	.88***
Item 7	.87***
Item 8	.89***
Item 9	.69***
Item 10	.80***
Item 11	.89***
Item 12	.83***
Item 13	.69***
Item 14	.89***
Item 15	.75***
Item 16	.78***

Item 17		.88***
Item 18		.77***
Item 19		.91***
Item 20		.76***
Item 21		.51*
Item 22		.55*
Item 23		.91***
	Factor C	
Item 1		.89***
Item 2		.89***
Item 3		.88***
	Factor D	
Item 1		.55*
Item 2		.74***
	Fator E	
Item 1		.88***
Item 2		.79***
Item 3		.84***
Item 4		.78***
Item 5		.68***
Item 6		.89***
	Factor F	
Item 1		.75***
Item 2		.53*
Item 3		.69***
Item 4		.83***
	Factor G	
Item 1		.59**
Item 2		.66**
Item 3		.56*
	Factor H	
Item 1		.44
Item 2		.38
Item 3		.72***
	Factor I	
Item 1		.14
	Factor J	
Item 1		.61**
	Factor K	
Item 1		.25
	Factor L	
Item 1		.46*

Notes: *p< .05; **p< .01; ***p < .001

FACTOR ANALYSIS

Fit indices of the CFA model for the NEWS-A-PT psychometric proprieties are shown in Table 3. The original 54-item model did not converge. Problems were found that the number of iterations exceeded. Considering that each latent factor should have at least three items, we eliminated factors that only had one item (factor I – Lack of parking; J – Lack of cul-de-sacs; K – Hilliness; and L – Physical barriers). Additionally, we eliminated factor D (Street connectivity) since it had only two items. The revised 48-item also displayed poor fit. Factor loadings were analyzed, as well as significance levels and several items were eliminated as recommended, namely; three items of factor A (Residential density – A1; A2; and A3), six items of factor B (Land use mix-diversity – B1; B9; B19; B20; B21; and B22), three items of factor E (Infrastructure and safety for walking – E3; E4; and E5), and one item of factor F (Aesthetics – F1), with low factor loadings. The factor G (Traffic hazards) was eliminated since all items had loadings below cutoff (<0.5). Factor loadings of the 48-item model are represented in Table 4. The revised 32-item model provided acceptable fit to the data. While TLI was slightly below cutoff, it was close to surpass the 0.90 score. Thus, we moved on examining factor loadings using the correlated six-factor model (Factor A – Residential density; Factor B – Land use mix-diversity; Factor C – Land use mix-access; Factor E – Infrastructure and safety for walking); Factor F (Aesthetics); and Factor H – Crime.

Table 3. Fit indexes of the NEWS-A-PT

Model	**χ2**	**df**	**CFI**	**TLI**	**SRMR**	**RMSEA (90% CI)**
54-item model (12 factors)	Did not converge					
48-item model (7 factors)	2686.930	1059	.785	.771	.071	.055 (.052; .057)
32-item model (6 factors)	1119.989	506	.908	.899	.063	.049 (.045; .053)

Notes: χ2 = qui-square test; df = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker Lewis Index; SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation; CI90% = Confidence Interval at 90%; * p < .001.

Analyses on the correlated six-factor model with 32-items (see Table 4) revealed that all item loadings on the target factor were greater than 0.50 and loaded significantly at p < 0.01. Additionally, responses to each perceived neighborhood environment factor were found to be internally consistent, as all factors within the correlated six-factor model

had composite reliability coefficient scores equal or above 0.70. Specifically, composite coefficients ranged between 0.70 (Factor E – Infrastructure and infrastructure for walking) and 0.92 (Factor B – Land use mixed-diversity).

Table 4. Factor loadings, standardized errors, and composite reliability coefficients of the correlated 48-item seven-factor (left) and the correlated 32-item six-factor model (right)

48-item model			**32-item model**	
Factors	**λ**	**SE**	**λ**	**SE**
Residential density			*.79*	
Item 1	.42*	.06	-	-
Item 2	-.10	.06	-	-
Item 3	-.43	.04	-	-
Item 4	.83*	.02	.64*	.04
Item 5	.71*	.04	.95*	.04
Item 6	.51*	.06	.61*	.04
Land use mix-diversity			*.92*	
Item 1	.44	.05	-	-
Item 2	.74*	.03	.74*	.03
Item 3	.50	.04	.50*	.04
Item 4	.52	.04	.51*	.04
Item 5	.61	.04	.61*	.04
Item 6	.76	.02	.76*	.02
Item 7	.62	.04	.62*	.04
Item 8	.67	.03	.66*	.03
Item 9	.40	.04	-	-
Item 10	.64	.03	.63*	.04
Item 11	.62	.03	.62*	.03
Item 12	.68	.03	.68*	.03
Item 13	.51	.04	.50*	.04
Item 14	.72	.03	.71*	.03
Item 15	.61	.04	.62*	.04
Item 16	.61	.03	.61*	.03
Item 17	.71	.03	.72*	.03
Item 18	.54	.04	.54*	.04
Item 19	.48	.04	-	-
Item 20	.28	.06	-	-
Item 21	.42	.05	-	-
Item 22	.27	.05	-	-
Item 23	.68	.03	.68*	.03
Land use mix-access			*.74*	
Item 1	.75*	.03	.75*	.04
Item 2	.74*	.04	.75*	.04
Item 3	.49*	.05	.59*	.05

Infrastructure and safety for walking			*.70*	
Item 1	.76*	.04	.77*	.04
Item 2	.58*	.05	.58*	.04
Item 3	.28	.05	-	-
Item 4	.41	.05	-	-
Item 5	.27	.07	-	-
Item 6	.61*	.05	.60*	.05
Aesthetics			*.76*	
Item 1	.43	.05	-	-
Item 2	.85*	.03	.86*	.04
Item 3	.68*	.04	.67*	.04
Item 4	.60*	.05	.59*	.05
Traffic hazards				
Item 1	.57	.12	-	-
Item 2	-.42	.12	-	-
Item 3	.48	.11	-	-
Crime			*.87*	
Item 1	.88*	.02	.89*	.02
Item 2	.77*	.03	.77*	.04
Item 3	.83*	.02	.82*	.02

Notes: λ = standardized factor loadings; SE = Standard Errors; composite reliability coefficients are in italic; * $p < .01$.

Convergent validity was achieved as the square root of AVE scores were above 0.50 as seen in Table 5. According to the squared correlations and square root of AVE scores in Table 5, all factors demonstrated adequate discriminant validity. In general, the correlations of the correlated six-factor model showed significant associations, specifically: a) Residential density showed positive correlations with Land use mix-diversity, Land use mix-access, Infrastructure and safety for walking, and Crime); b) Land use mix-diversity displayed positive correlations with all the other factors; c) Land use mix-access was positively correlated with Residential density, Land use mix-diversity, Aesthetics, and Crime, while it showed a negative correlation with Infrastructure and safety for walking; d) Infrastructure and safety for walking showed positive correlations with Residential density, Land use mix-diversity, Aesthetics and Crime, and a negative correlation with Land use mix-access; e) Aesthetics was positively correlated with Land use mix-diversity, Land use mix-access and Infrastructure and safety for walking, and negatively correlated with Crime; f) Crime was positively correlated with Residential density, Land use mix-diversity, Land use

mix-access and Infrastructure and safety for walking, and negatively correlated with Aesthetics.

Table 5. Convergent and discriminant validity analysis

Factors	AVE	√AVE	1	2	3	4	5	6
1. Residential density	.56	.75	1	.03	.10	.10	.00	.04
2. Land use mixed-diversity	.39	.62	.17**	1	.34	.21	.04	.01
3. Land use mixed-access	.48	.69	.31**	.58**	1	.49	.07	.01
4. Infrastructure safety walking	.42	.65	.32**	.46**	-.70**	1	.05	.01
5. Aesthetics	.51	.71	-.06	.21**	.27**	.23*	1	.02
6. Crime	.68	.83	.21**	.10*	.11*	.12*	-.14*	1

Notes: AVE = Average Variance Extracted; below diagonal line = correlations; above diagonal line = squared correlations; * $p < .05$; ** $p < .01$

CORRELATIONAL ANALYSIS

Correlations between NEWS-A-PT factors and the levels of PA and quality of life constructs are seen in Table 6. Significant associations were found, namely: a) Land use mix-diversity was positively correlated with total PA, walking PA, Overall quality of life and general health, Psychological health, Social relationships and Environment; b) Land use mix-access was positively correlated with total PA, walking PA, Overall quality of life and general health, Physical health, Psychological health, Social relationships and Environment; c) Infrastructure and safety for walking displayed a positive correlation with total PA, walking PA, Overall quality of life and general health, Psychological health, Social relationships and Environment; d) Aesthetics was positively correlated with total PA, Overall quality of life and general health, Physical health, Psychological health, Social relationships and Environment; e) Crime was negatively correlated with Overall quality of life and general health, Physical health, Psychological health and Environment.

Table 6. Correlational analysis

Factors	Total PA	Walking PA	Overall QoL and general health	Physical health	Psychological health	Social relationships	Environment
A. Residential density	.02	.07	-.01	-.04	-.02	.05	-.05
B. Land use mix-diversity	.18**	.12**	.12**	.06	.13**	.13**	.13**
C. Land use mix-access	.09*	.16**	.15**	.12**	.12**	.15**	.18**
E. Infrastructure safety walking	.11*	.17**	.18**	.08	.15**	.16**	.17**
F. Aesthetics	.10*	.07	.20**	.10*	.18**	.14**	.21**
H. Crime	.02	.05	-.14**	-.20**	-.13**	-.05	-.28**

Notes: * p < .05; ** p < .01

DISCUSSION

The main purpose of this study was to translate and validate the NEWS-A in a sample of Portuguese college students. The final psychometric testing of the 32-item model of the NEWS-A-PT revealed good properties. Additionally, correlational analyses were conducted considering neighborhood environment subscales, PA, and quality of life dimensions. We discuss these findings in more detail below.

TEST-RETEST ANALYSIS

As far as the test-retest analysis is concerned, problems were found in the translated 54-item version of the NEWS-A. Specifically, the following items displayed ICC values <0.70: B9, B13, B21, B22 (Land use-mixed diversity); D1 (Street connectivity); E5

(Infrastructure and safety for walking); F2, F3 (Aesthetics); G1, G2, G3 (Traffic hazards), H1, H2 (Crime); I1 (Lack of parking); J1 (Lack of cul-de-sacs); K1 (Hilliness); and L1 (Physical barriers). The validation study of the NEWS-A (Cerin et al., 2006) used the test-retest reliability results of the original NEWS, obtained by Saelens et al. (2003a), whom provided the ICC values for each subscale, but not for each item. This makes direct comparisons with our study difficult, especially if we consider that the NEWS and the NEWS-A, although similar, are not equal. Nevertheless, although Saelens et al. (2003a) state that most NEWS subscales display ICC values >0.75, they still reported values <0.70 in some subscales, namely: Residential density (0.63); Street connectivity (0.63); and Walking/cycling facilities (0.58). Accordingly, a modified version of the NEWS, developed in Australia by Leslie et al. (2005), also reported values <0.70 in some items. Again, we reinforce that the NEWS and the NEWS-A are not equal. Hence, comparisons with our study should be made with caution. Still, some of the items identified by Leslie et al. (2005) as having values <0.70, were consistent with our findings. Specifically, the items equivalent to B21, D1, F2, G1, G2, H2, H3, I1, and L1 displayed values <0.70. These results suggest that some temporal reliability issues found in the Portuguese version of the NEWS-A (NEWS-A-PT), are common to the NEWS, in which the NEWS-A was based, and may not be specifically related with the translation and adaptation to Portuguese. Despite the temporal reliability issues found in the 54-item version of the NEWS-A-PT, the final version of the questionnaire only includes 32 items. Regarding the items which displayed ICC values <0.70, only the following were included in the final version: B13, F2, F3, H1, H2, and H3. Nonetheless, some of them were close to achieving acceptable scores of temporal reliability. In this sense, most items included in the final version of the NEWS-A-PT displayed ICC values >0.70 and, therefore, the mentioned instrument displays acceptable levels of temporal reliability.

FACTOR ANALYSIS

As previously mentioned in the present study, past research supported the correlated six-factor model (i.e., Land use mix-access; Street connectivity; Infrastructure and safety for walking; Aesthetics; Traffic hazards; Crime) of the NEWS-A (Cerin et al. 2006; Cerin et al., 2009). In addition to the mentioned six latent factors, a transcultural study conducted by Cerin et al. (2013) also analyzed two single item subscales common

to several countries, namely: Lack of cul-de-sacs, and Physical barriers. However, all the mentioned studies excluded the Residential density and the Land use mix-diversity subscales stating that, due to their response format, they were not factor analyzable. However, as empirically tested in this study, since item response to the items related to Residential density and the Land use mix-diversity subscales are scored on a Likert-type scale, these latent factors can and should be considered in factor analysis. In CFA, model solutions allow all possible construct-relevant information to be modeled. Thus, the CFA approach makes full use of the multidimensional conceptualization of all neighborhood environment walkability constructs.

Besides, the proposed correlated six-factor model (Cerin et al. 2006; Cerin et al., 2009) includes one latent factor with less than three items (Street connectivity – two items), which does not comply with existing guidelines suggesting that at least three items are needed from latent factor saturation and explained variance (Hair et al., 2019). Likewise, the transcultural study conducted by Cerin et al. (2013) considered subscales with only two items in some of its analyzes (i.e., the Belgian and the British models only included two items in the Land use mix-access factor; the Street connectivity subscale was tested for two items in all countries; the Lack of cul-de-sacs and Physical barriers to walking single-item subscales were also tested for all countries), since not all items were common to all subscales of all the participant countries. Hence, to our knowledge, the present study was the first to assess the factorial structure of the complete 54-item version of the NEWS-A. As previously mentioned in the results section, the original 54-item model did not converge, and the Street connectivity factor, with less than three items, was excluded. The four single-item subscales were tested together but, as expected, they did not load into the same factor. Therefore, the four items were also eliminated. Still, with the resulting 48-item model displaying poor fit, factor loadings were analyzed and items were eliminated in accordance: A1, A2, A3 (Residential density); B1, B9, B19, B20, B21, B22 (Land use mix-diversity); E3, E4, E5 (Infrastructure and safety for walking); F1 (Aesthetics); and all three items from the Traffic hazards factor. Additionally, among the eliminated items, many of them had shown reliability values <0.70 in our test-retest analysis (i.e., B9, B21, B22, D1, E5, G1, G2, G3, I1, J1, K1, and L1), further supporting the decision to eliminate them. It is worthy to mention that the procedure of taking psychometric proprieties in

consideration to eliminate items, has also been endorsed by Cerin et al. (2006), when they adapted the NEWS-A from the original NEWS.

All items loaded significantly onto their predefined factor in the 32-item model, supporting factor validity. Furthermore, acceptable ICC were found in all six factors of the 32-item model, providing reliability of the factors associated to the NEWS-A-PT. AVE values indicated that convergent validity was achieved since scores were above cutoff (Hair et al., 2019). Additionally, we examined and confirmed discriminant validity for 15 of the 15 possible comparisons, meaning that factors are distinct between each other. By supporting both convergent and discriminant validity, the present study is in line with previous findings obtained by Cerin et al. (2006). Still, to our knowledge, this was the first study to include the Residential density and Land use mix-diversity subscales in this sort of analysis, which further strengthens the decision to include both subscales in the CFA model.

Correlational Analysis

In general, significant associations between perceived neighborhood environment attributes and PA were found, which is consistent with previous findings (Bauman et al., 2012; Cerin et al., 2006; Molina-García et al., 2019; Patterson et al., 2020; Saelens et al., 2003a; Saelens et al., 2003b; Sallis et al., 2016; Patterson et al, 2020; Yang et al., 2017). Regarding overall PA, significant associations were found with the Land use mix-diversity, Land use mix-access, Infrastructure and safety for walking, and Aesthetics. This is aligned with the results obtained by previous authors. For instance, Bauman et al. (2012), found positive correlations between total PA and environment attributes such as transport environment, aesthetics, and the existence of recreation facilities and locations. In turn, Sallis et al. (2016) found positive and significant associations between PA levels and residential density, access to public transports, and access to parks. Regarding residential density, our results do not comply with the ones obtained by Sallis et al. (2016). As far as walking PA is concerned, based on the NEWS-A (Cerin et al., 2006) scoring protocol, higher scores in the Residential density, Land use mix-diversity, Land use mix-access, Infrastructure and safety for walking, and Aesthetics subscales, are deemed to denote higher walkability, as opposed to the Crime subscale. In general, our results support this assumption, except for the Residential density and Crime subscales, which were positively, but not significantly, associated

with walking PA. Interestingly, although Cerin et al. (2006) expected otherwise, they also found positive associations between the Crime subscale and walking PA. Although our study did not control for other variables, we hypothesize that this positive association could be due to the influence of some other variable, such as socioeconomic status. For instance, individuals with a low socioeconomic status living in areas with higher crime rates, could gather less conditions to use their own private vehicles, being more dependent on walking PA for transport purposes.

Regarding the associations between perceived neighborhood environment characteristics and quality of life, we found positive and significant associations between quality of life indicators and the Land use mix-diversity, Land use mix-access, Infrastructure and safety for walking, and Aesthetics subscales. In turn, the Residential density subscale displayed no significant associations with quality of life indicators. Regarding the Crime subscale, we found significantly negative associations with several quality of life indicators, namely: Overall quality of life and general health, Physical health, Psychological health and Environment. In this sense, in general, our results are conflicting with those obtained by Sallis et al. (2009), whom did not find positive associations between quality of life and neighborhood walkability. On the other hand, our findings support those of Gao et al. (2016) and Sarmiento et al. (2010), which found positive associations between quality of life indicators and perceived neighborhood environment attributes. Since the mentioned studies were conducted in multiple settings, in countries with different socioeconomic and cultural backgrounds, further studies are needed in order to clarify the associations between perceived neighborhood environment characteristics and quality of life indicators.

Limitations and Agenda for Future Research

The present study makes a valuable contribution to the literature, not only by providing a valid and reliable instrument to assess perceived neighborhood environment characteristics, but also by producing more evidence on how this perception is associated with self-reported PA and quality of life indicators. In addition, considering the extent of the NEWS-A, this 32-item version could decrease the burden of participants in further investigations, since we reduced the scale according to theoretical and statistical results. Still, it entails several limitations that must be given full consideration. First, it is important to consider that this was a cross-sectional study,

which does not allow making causality inferences. For instance, it is not possible to determine whether perceived neighborhood environment characteristics actually influence PA and quality of life, or if PA levels and perceived quality of life influence perceived neighborhood environment characteristics. By designing longitudinal studies, future researchers could help clarifying these associations.

Furthermore, variables regarding PA levels, quality of life indicators, and neighborhood environment characteristics were collected using self-reported measures, which may have biased some information. To address this issue, future studies regarding this subject should cross information collected by subjective measures with more objective ones (e.g., using accelerometers to measure PA levels, and geographical information systems to access attributes related to the built environment), since they could provide more accurate data.

Besides, regarding the NEWS-A-PT, our sample included college students from all over the country, which entails multiple regional idiosyncrasies, regarding both cultural and geographical aspects. Additionally, while some students are expected to live in highly urbanized regions, others may live in rural areas. Therefore, this may have influenced some responses to the mentioned instrument, by increasing variability. This problem could be addressed in future studies, by including samples from more specific and well-defined geographical areas. Ultimately, although we provided a comprehensive factor analysis on the NEWS-A, which we believe helped solving some of the instruments´ inconsistencies, it resulted in a 32-items instrument, with a different factorial structure when compared to studies developed in other countries. In this sense, future hypothetical transcultural studies including the NEWS-A-PT could make comparability between countries more difficult.

CONCLUSION

In summary, the present study provides empirical support for the validity and reliability of the six-factor and 32-item version of the NEWS-A-PT for Portuguese college students. Future cross-validation studies could be needed, in order to use the instrument in other samples (e.g., Portuguese adult workers).

Besides, the present study also supports the assumption that perceived neighborhood environment characteristics are associated with both PA and quality of life indicators.

This suggests that investing in supportive built environment attributes may help increasing PA levels and quality of life indicators among college students. Nevertheless, the present study does not clarify whether investing in physical changes of the neighborhood environment could be enough to change perceived neighborhood environment walkability. Therefore, future studies should focus on how physical changes in the built environment translate into individual perceptions of neighborhood walkability. Furthermore, we also encourage future researchers to develop longitudinal studies, in order to further understand how perceived neighborhood environment, PA and quality of life may influence one another.

GENERAL CONCLUSION

The present work approaches AC as a strategy to fight physical inactivity and climate change, which are two major contemporary public health issues. In this sense, it focuses on a particular matter known to be important in the promotion of PA in general and AC in particular, as well as quality of life: the built environment. Therefore, by providing a valid and reliable measure of perceived neighborhood environment characteristics (i.e., NEWS-A-PT), the present work makes a valuable contribution towards future research and/or programs concerning the role of the built environment on PA, AC and quality of life.

Besides, by investigating how perceived neighborhood environment characteristics correlate to PA and quality of life, the present work provides relevant information, which may set the basis for future empirically-driven urban design interventions. This is of upmost importance, since it would allow a more holistic approach regarding how communities interact with their environment, and how the later could be conceived as a mean to promote PA and quality of life across the population.

As previously mentioned, one of the greatest limitations of the present work is that is was cross-sectional in design. In this sense, future researchers should seek to overcome this limitation, by designing longitudinal studies. This would allow more detailed information regarding the associations between variables such as perceived neighborhood environment, PA, and quality of life. Additionally, considering the important role of AC in the promotion of PA and in the mitigation of climate change, future researchers should also seek to understand to what extent the perceived neighborhood environment characteristics relate to commuting choices.

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APPENDICES

APPENDIX 1- ORIGINAL NEWS-A VERSION AND INITIAL VERSION (54 ITEMS) OF THE NEWS-A-PT

Neighborhood Environment Walkability Scale (NEWS) – Abbreviated

Neighborhood Environment Walkability Scale – Abbreviated Portuguese Version (NEWS-A-PT)

We would like to find out more information about the way that you perceive or think about your neighborhood. Please answer the following questions about your neighborhood and yourself.

Gostaríamos de obter mais informações acerca da forma como perceciona ou pensa acerca do seu bairro. Por favor responda às seguintes questões acerca do seu bairro e sobre si.

A. Types of residences in your neighborhood

A. Tipos de habitações no seu bairro

Please circle the answer that best applies to you and your neighborhood.

Por favor, assinale com um círculo a resposta que melhor se aplica a si e ao seu bairro.

<table>
<tr><td colspan="5"></td><td>Included in the final version of NEWS-A-PT</td></tr>
<tr><td colspan="5">1. How common are <u>detached single-family residences</u> in your immediate neighborhood?

1. Quão comuns são as <u>moradias unifamiliares</u> nas imediações da sua zona de residência?</td><td rowspan="2">No</td></tr>
<tr><td>1 None</td><td>2 A few
2 Um</td><td>3 Some</td><td>4Most</td><td>5 All</td></tr>
</table>

1 Nada	**pouco**	**3 Algo**	**4 Maioritariamente**	**5 Totalmente**	
2. How common <u>are townhouses or row houses of 1-3 stories</u> in your immediate neighborhood? **2. Quão comuns são as <u>moradias geminadas de 1-3 andares</u> nas imediações da sua zona de residência?**					No
1 None **1 Nada**	2 A few **2 Um pouco**	3 Some **3 Algo**	4Most **4 Maioritariamente**	5 All **5 Totalmente**	
3. How common are <u>apartments or condos 1-3 stories</u> in your immediate neighborhood? **3. Quão comuns são os <u>prédios/condomínios de 1-3 andares</u> nas imediações da sua zona de residência?**					No
1 None **1 Nada**	2 A few **2 Um pouco**	3 Some **3 Algo**	4Most **4 Maioritariamente**	5 All **5 Totalmente**	
4. How common are <u>apartments or condos 4-6 stories</u> in your immediate neighborhood? **4. Quão comuns são os <u>prédios/condomínios de 4-6 andares</u> nas imediações da sua zona de residência?**					Yes
1 None **1 Nada**	2 A few **2 Um**	3 Some **3 Algo**	4Most **4 Maioritariamente**	5 All **5 Totalmente**	

	pouco				
5. How common are <u>apartments or condos 7-12 stories</u> in your immediate neighborhood? **5. Quão comuns são os <u>prédios/condomínios de 7-12 andares</u> nas imediações da sua zona de residência?**					Yes
1 None **1 Nada**	2 A few **2 Um pouco**	3 Some **3 Algo**	4Most **4 Maioritariamente**	5 All **5 Totalmente**	
6. How common are <u>apartments or condos more than 13 stories</u> in your immediate neighborhood? **6. Quão comuns são os <u>prédios/condomínios de mais de 13 andares</u> nas imediações da sua zona de residência?**					Yes
1 None **1 Nada**	2 A few **2 Um pouco**	3 Some **3 Algo**	4Most **4 Maioritariamente**	5 All **5 Totalmente**	

B. Stores, facilities, and other things in your neighborhood

B. Lojas, serviços/comércio e outras coisas no seu bairro

About how long would it take to get from your home to the <u>nearest</u> businesses or facilities listed below if you <u>walked</u> to them? Please put only <u>one</u> check mark (√) for each business or facility.

Quanto tempo demoraria para ir de sua casa até aos serviços ou locais <u>mais próximos</u> listados abaixo ao deslocar-se <u>a pé</u>? Por favor, coloque apenas <u>uma</u> marca de verificação (√) para cada serviço ou local.

							Included in the final version of NEWS-A-PT
	1-5 min	6-10 min	11-20 min	20-30 min	30+ min	don't know **não sei/não se aplica**	
example: gas station **exemplo: posto de combustível**	1. ____	2. ____	3. √__	4. ____	5. ____	6. ____	
1. convenience/small grocery store **1.pequena mercearia/loja de conveniência**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	No
2. supermarket **2. supermercado**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	Yes
3. hardware store **3. loja de materiais de construção**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	Yes
4. fruit/vegetable market **4. mercado de**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	Yes

frutas/legumes							
5. laundry/dry cleaners **5. lavandaria**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	Yes
6. clothing store **6. loja de roupas**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	Yes
7. post office **7. posto dos correios**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	Yes
8. library **8. biblioteca**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	Yes
9. elementary school **9. escola primária**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	No
10. other schools **10. outras escolas**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	Yes
11. book store **11. livraria**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	Yes
12. fast food restaurant **12. restaurante de fast food**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	Yes
13. coffee place **13. café**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	Yes
14. bank/credit union **14. banco**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	Yes
15. non-fast food	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	Yes

restaurant **15. restaurante**							
16. video store **16. cinema**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	Yes
17. pharmacy/drug store **17. farmácia/parafarmácia**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	Yes
18. salon/barber shop **18. salão de cabeleireiro/barbearia**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	Yes
19. your job or school [check here _____ if not applicable] **19. o seu emprego ou escola** **[assinale aqui _____ se não for aplicável]**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	No
20. bus or train stop **20. paragem de autocarro ou de comboio**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	No
21. park **21. jardim/espaços verdes**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	No
22. recreation center **22. centro recreativo**	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	No
23. gym or fitness	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____	

facility **23. ginásio ou health club**							Yes

C. Access to services

C. Acesso a serviços

Please circle the answer that best applies to you and your neighborhood. Both <u>local</u> and <u>within walking distance</u> mean within a 10-15 minute walk from your home.

Por favor, assinale com um círculo a resposta que melhor se aplica a si e à sua zona de residência. Tanto <u>local</u> como <u>a uma caminhada de curta distância</u> significam entre 10-15 minutos desde sua casa.

<table>
<tr><td colspan="4"></td><td>Included in the final version of NEWS-A-PT</td></tr>
<tr><td colspan="4">1. Stores are within easy walking distance of my home.

1. As lojas ficam a uma caminhada de curta distância de minha casa.</td><td rowspan="2">Yes</td></tr>
<tr><td>1 strongly disagree

1 discordo totalmente</td><td>2 somewhat disagree

2 discordo</td><td>3 somewhat agree

3 concordo</td><td>4 strongly agree

4 concordo totalmente</td></tr>
<tr><td colspan="4">2. There are many places to go within easy walking distance of my home.

2. Há muitos locais de conveniência onde ir a uma caminhada de curta distância de minha casa.</td><td rowspan="2">Yes</td></tr>
<tr><td>1 strongly disagree</td><td>2 somewhat disagree</td><td>3 somewhat agree</td><td>4 strongly agree</td></tr>
</table>

1 discordo totalmente	**2 discordo**	**3 concordo**	**4 concordo totalmente**	
3. It is easy to walk to a transit stop (bus, train) from my home. **3. É fácil caminhar até uma paragem de transportes públicos (autocarro, comboio) a partir de minha casa.**				Yes
1 strongly disagree **1 discordo totalmente**	2 somewhat disagree **2 discordo**	3 somewhat agree **3 concordo**	4 strongly agree **4 concordo totalmente**	

D. Streets in my neighborhood

D. Ruas no meu bairro

Please circle the answer that best applies to you and your neighborhood.

Por favor, assinale com um círculo a resposta que melhor se aplica a si e ao seu bairro.

				Included in the final version of NEWS-A-PT
1. The distance between intersections in my neighborhood is usually short (100 yards or less; the length of a football field or less). **1. A distância entre cruzamentos no meu bairro é geralmente curta (100 metros ou menos; o comprimento de um campo de futebol ou menos).**				No
1 strongly disagree	2 somewhat disagree	3 somewhat agree	4 strongly agree	

1 discordo totalmente	**2 discordo**	**3 concordo**	**4 concordo totalmente**	
2. There are many alternative routes for getting from place to place in my neighborhood. (I don't have to go the same way every time.) **2. Há muitos caminhos alternativos para ir de um lugar para o outro no meu bairro (Não tenho de ir sempre pelo mesmo percurso).**				No
1 strongly disagree **1 discordo totalmente**	2 somewhat disagree **2 discordo**	3 somewhat agree **3 concordo**	4 strongly agree **4 concordo totalmente**	

E. Places for walking and cycling

E. Locais para caminhar e andar de bicicleta

Please circle the answer that best applies to you and your neighborhood.

Por favor, assinale com um círculo a resposta que melhor se aplica a si e ao seu bairro.

				Included in the final version of NEWS-A-PT
1. There are sidewalks on most of the streets in my neighborhood. **1. Existem passeios na maioria das ruas do meu bairro.**				Yes
1 strongly disagree **1 discordo totalmente**	2 somewhat disagree **2 discordo**	3 somewhat agree **3 concordo**	4 strongly agree **4 concordo totalmente**	
2. Sidewalks are separated from the road/traffic in my neighborhood by parked cars.				

<table>
<tr><td colspan="4">2. No meu local de residência, os passeios são separados da estrada por carros estacionados.</td><td rowspan="2">Yes</td></tr>
<tr><td>1 strongly disagree
1 discordo totalmente</td><td>2 somewhat disagree
2 discordo</td><td>3 somewhat agree
3 concordo</td><td>4 strongly agree
4 concordo totalmente</td></tr>
<tr><td colspan="4">3. There is a grass/dirt strip that separates the streets from the sidewalks in my neighborhood.

3. Existe uma faixa de relva/terra que separa as ruas dos passeios no meu bairro.</td><td rowspan="2">No</td></tr>
<tr><td>1 strongly disagree
1 discordo totalmente</td><td>2 somewhat disagree
2 discordo</td><td>3 somewhat agree
3 concordo</td><td>4 strongly agree
4 concordo totalmente</td></tr>
<tr><td colspan="4">4. My neighborhood streets are well lit at night.

4. As ruas do meu bairro são bem iluminadas à noite.</td><td rowspan="2">No</td></tr>
<tr><td>1 strongly disagree
1 discordo totalmente</td><td>2 somewhat disagree
2 discordo</td><td>3 somewhat agree
3 concordo</td><td>4 strongly agree
4 concordo totalmente</td></tr>
<tr><td colspan="4">5. Walkers and bikers on the streets in my neighborhood can be easily seen by people in their homes.

5. Na minha área de residência, os peões e os ciclistas podem ser facilmente vistos pelas pessoas através das suas casas.</td><td rowspan="2">No</td></tr>
<tr><td>1 strongly disagree
1 discordo totalmente</td><td>2 somewhat disagree
2 discordo</td><td>3 somewhat agree
3 concordo</td><td>4 strongly agree
4 concordo totalmente</td></tr>
</table>

6. There are crosswalks and pedestrian signals to help walkers cross busy streets in my neighborhood. **6. Existem passadeiras e sinais para peões que ajudam a atravessar as ruas no meu bairro.**				Yes
1 strongly disagree **1 discordo totalmente**	2 somewhat disagree **2 discordo**	3 somewhat agree **3 concordo**	4 strongly agree **4 concordo totalmente**	

F. Neighborhood surroundings/aesthetics

F. Arredores do bairro/estética

Please circle the answer that best applies to you and your neighborhood.

Por favor, assinale com um círculo a resposta que melhor se aplica a si e ao seu bairro.

				Included in the final version of NEWS-A-PT
1. There are trees along the streets in my neighborhood. **1. Existem árvores ao longo das ruas no meu bairro.**				No
1 strongly disagree **1 discordo totalmente**	2 somewhat disagree **2 discordo**	3 somewhat agree **3 concordo**	4 strongly agree **4 concordo totalmente**	
2. There are many interesting things to look at while walking in my neighborhood.				

<table>
<tr><td colspan="4">2. Existem muitas coisas interessantes para ver enquanto caminho no meu bairro.</td><td rowspan="2">Yes</td></tr>
<tr><td>1 strongly disagree
1 discordo totalmente</td><td>2 somewhat disagree
2 discordo</td><td>3 somewhat agree
3 concordo</td><td>4 strongly agree
4 concordo totalmente</td></tr>
<tr><td colspan="4">3. There are many attractive natural sights in my neighborhood (such as landscaping, views).
3. Existem muitos pontos naturais atrativos no meu bairro (como paisagens, vistas)</td><td rowspan="2">Yes</td></tr>
<tr><td>1 strongly disagree
1 discordo totalmente</td><td>2 somewhat disagree
2 discordo</td><td>3 somewhat agree
3 concordo</td><td>4 strongly agree
4 concordo totalmente</td></tr>
<tr><td colspan="4">4. There are attractive buildings/homes in my neighborhood.
4. Existem edifícios/casas atrativos(as) no meu bairro.</td><td rowspan="2">Yes</td></tr>
<tr><td>1 strongly disagree
1 discordo totalmente</td><td>2 somewhat disagree
2 discordo</td><td>3 somewhat agree
3 concordo</td><td>4 strongly agree
4 concordo totalmente</td></tr>
</table>

G. Traffic hazards

G. Perigos relacionados com o trânsito

Please circle the answer that best applies to you and your neighborhood.

Por favor, assinale com um círculo a resposta que melhor se aplica a si e ao seu bairro.

<table>
<tr><td colspan="4"></td><td>Included in the final version of NEWS-A-PT</td></tr>
<tr><td colspan="4">1.There is so much traffic along <u>nearby</u> streets that it makes it difficult or unpleasant to walk in my neighborhood.

1. O trânsito nas ruas próximas é tanto, que se torna difícil ou desagradável caminhar no meu bairro.</td><td rowspan="2">No</td></tr>
<tr><td>1 strongly disagree

1 discordo totalmente</td><td>2 somewhat disagree

2 discordo</td><td>3 somewhat agree

3 concordo</td><td>4 strongly agree

4 concordo totalmente</td></tr>
<tr><td colspan="4">2. The speed of traffic on most <u>nearby</u> streets is usually slow (30 mph or less).

2. A velocidade do trânsito nas ruas <u>próxima</u>s é geralmente lenta (50km/h ou menos).</td><td rowspan="2">No</td></tr>
<tr><td>1 strongly disagree

1 discordo totalmente</td><td>2 somewhat disagree

2 discordo</td><td>3 somewhat agree

3 concordo</td><td>4 strongly agree

4 concordo totalmente</td></tr>
<tr><td colspan="4">3. Most drivers exceed the posted speed limits while driving in my neighborhood.

3. A maioria dos condutores excede o limite de velocidade quando conduz no meu bairro.</td><td rowspan="2">No</td></tr>
<tr><td>1 strongly disagree

1 discordo totalmente</td><td>2 somewhat disagree

2 discordo</td><td>3 somewhat agree

3 concordo</td><td>4 strongly agree

4 concordo totalmente</td></tr>
</table>

H. Crime

H. Criminalidade

Please circle the answer that best applies to you and your neighborhood.

Por favor, assinale com um círculo a resposta que melhor se aplica a si e ao seu bairro.

<table>
<tr><td colspan="4"></td><td>Included in the final version of NEWS-A-PT</td></tr>
<tr><td colspan="4">1. There is a high crime rate in my neighborhood.

1. Existe uma taxa de criminalidade elevada no meu bairro.</td><td rowspan="2">Yes</td></tr>
<tr><td>1 strongly disagree

1 discordo totalmente</td><td>2 somewhat disagree

2 discordo</td><td>3 somewhat agree

3 concordo</td><td>4 strongly agree

4 concordo totalmente</td></tr>
<tr><td colspan="4">2. The crime rate in my neighborhood makes it unsafe to go on walks <u>during the day</u>.

2. A taxa de criminalidade no meu bairro faz com que seja inseguro fazer caminhadas <u>durante o dia</u>.</td><td rowspan="2">Yes</td></tr>
<tr><td>1 strongly disagree

1 discordo totalmente</td><td>2 somewhat disagree

2 discordo</td><td>3 somewhat agree

3 concordo</td><td>4 strongly agree

4 concordo totalmente</td></tr>
<tr><td colspan="4">3. The crime rate in my neighborhood makes it unsafe to go on walks <u>at night</u>.

3. A taxa de criminalidade no meu bairro faz com que seja inseguro fazer caminhadas <u>durante a noite</u>.</td><td></td></tr>
</table>

1 strongly disagree **1 discordo totalmente**	2 somewhat disagree **2 discordo**	3 somewhat agree **3 concordo**	4 strongly agree **4 concordo totalmente**	Yes

I. Parking

I. Estacionamento

Please circle the answer that best applies to you and your neighborhood.

Por favor, assinale com um círculo a resposta que melhor se aplica a si e ao seu bairro.

				Included in the final version of NEWS-A-PT
1. Parking is difficult in local shopping areas. **1. É difícil estacionar nas zonas comerciais locais.**				No
1 strongly disagree **1 discordo totalmente**	2 somewhat disagree**2 discordo**	3 somewhat agree **3 concordo**	4 strongly agree **4 concordo totalmente**	

J. Cul-de-sacs

J. Becos sem saída

Please circle the answer that best applies to you and your neighborhood.

Por favor, assinale com um círculo a resposta que melhor se aplica a si e ao seu bairro.

				Included in the final version of NEWS-A-PT
1. The streets in my neighborhood do not have many cul-de-sacs (dead-end streets). **1. As ruas no meu bairro têm muitos becos sem saída.**				No
1 strongly disagree **1 discordo totalmente**	2 somewhat disagree **2 discordo**	3 somewhat agree **3 concordo**	4 strongly agree **4 concordo totalmente**	

K. Hilliness

K. Terreno acidentado

Please circle the answer that best applies to you and your neighborhood.

Por favor, assinale com um círculo a resposta que melhor se aplica a si e ao seu bairro.

				Included in the final version of NEWS-A-PT
1. The streets in my neighborhood are hilly, making my neighborhood difficult to walk in. **1. As ruas do meu bairro são íngremes, tornando-se difícil fazer caminhadas.**				No
1 strongly	2 somewhat	3 somewhat		

disagree **1 discordo totalmente**	disagree **2 discordo**	agree **3 concordo**	4 strongly agree **4 concordo totalmente**	

L. Physical barriers

L. Barreiras físicas

Please circle the answer that best applies to you and your neighborhood.

Por favor, assinale com um círculo a resposta que melhor se aplica a si e ao seu bairro.

				Included in the final version of NEWS-A-PT
1. There are major barriers to walking in my local area that make it hard to get from place to place (for example, freeways, railway lines, rivers). **1. Existem barreiras consideráveis para caminhar na minha área local que fazem com que seja difícil ir de um lugar para outro (por exemplo, autoestradas, linhas de caminhos de ferro, rios).**				No
1 strongly disagree **1 discordo totalmente**	2 somewhat disagree **2 discordo**	3 somewhat agree **3 concordo**	4 strongly agree **4 concordo totalmente**	

APPENDIX 2- FINAL VERSION OF THE NEWS-A-PT (32 ITEMS)

Neighborhood Environment Walkability Scale – Abbreviated Portuguese Version (NEWS-A-PT)

Gostaríamos de obter mais informações acerca da forma como perceciona ou pensa acerca do seu bairro. Por favor responda às seguintes questões acerca do seu bairro e sobre si.

Tipos de habitações no seu bairro

Por favor, assinale com um círculo a resposta que melhor se aplica a si e ao seu bairro.

1. Quão comuns são os <u>prédios/condomínios de 4-6 andares</u> nas imediações da sua zona de residência?				
1 Nada	2 Um pouco	3 Algo	4 Maioritariamente	5 Totalmente
2. Quão comuns são os <u>prédios/condomínios de 7-12 andares</u> nas imediações da sua zona de residência?				
1 Nada	2 Um pouco	3 Algo	4 Maioritariamente	5 Totalmente
3. Quão comuns são os <u>prédios/condomínios de mais de 13 andares</u> nas imediações da sua zona de residência?				
1 Nada	2 Um pouco	3 Algo	4 Maioritariamente	5 Totalmente

Lojas, serviços/comércio e outras coisas no seu bairro

Quanto tempo demoraria para ir de sua casa até aos serviços ou locais mais próximos listados abaixo ao deslocar-se a pé? Por favor, coloque apenas uma marca de verificação (√) para cada serviço ou local.

	1-5 min	6-10 min	11-20 min	20-30 min	30+ min	não sei/não se aplica
exemplo: posto de combustível	1. ____	2. ____	3. √	4. ____	5. ____	6. ____
1. supermercado	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____
2. loja de materiais de construção	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____
3. mercado de frutas/legumes	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____
4. lavandaria	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____
5. loja de roupas	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____
6. posto dos correios	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____
7. biblioteca	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____
8. escolas	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____
9. livraria	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____
10. restaurante de fast food	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____
11. café	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____
12. banco	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____

13. restaurante	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____
14. cinema	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____
15. farmácia/parafarmácia	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____
16. salão de cabeleireiro/barbearia	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____
17. ginásio ou health club	1. ____	2. ____	3. ____	4. ____	5. ____	6. ____

Acesso a serviços

Por favor, assinale com um círculo a resposta que melhor se aplica a si e à sua zona de residência. Tanto local como a uma caminhada de curta distância significam entre 10-15 minutos desde sua casa.

1. As lojas ficam a uma caminhada de curta distância de minha casa.			
1 discordo totalmente	2 discordo	3 concordo	4 concordo totalmente
2. Há muitos locais de conveniência onde ir a uma caminhada de curta distância de minha casa.			
1 discordo totalmente	2 discordo	3 concordo	4 concordo totalmente
3. É fácil caminhar até uma paragem de transportes públicos (autocarro, comboio) a partir de minha casa.			
1 discordo totalmente	2 discordo	3 concordo	4 concordo totalmente

Locais para caminhar e andar de bicicleta

Por favor, assinale com um círculo a resposta que melhor se aplica a si e ao seu bairro.

1. Existem passeios na maioria das ruas do meu bairro.			
1 discordo totalmente	2 discordo	3 concordo	4 concordo totalmente
2. No meu local de residência, os passeios são separados da estrada por carros estacionados.			
1 discordo totalmente	2 discordo	3 concordo	4 concordo totalmente
3. Existem passadeiras e sinais para peões que ajudam a atravessar as ruas no meu bairro.			
1 discordo totalmente	2 discordo	3 concordo	concordo totalmente

Arredores do bairro/estética

Por favor, assinale com um círculo a resposta que melhor se aplica a si e ao seu bairro.

1. Existem muitas coisas interessantes para ver enquanto caminho no meu bairro.			
1 discordo totalmente	2 discordo	3 concordo	4 concordo totalmente
2. Existem muitos pontos naturais atrativos no meu bairro (como paisagens, vistas)			
1 discordo totalmente	2 discordo	3 concordo	4 concordo totalmente

3. Existem edifícios/casas atrativos(as) no meu bairro.			
1 discordo totalmente	2 discordo	3 concordo	4 concordo totalmente

Criminalidade

Por favor, assinale com um círculo a resposta que melhor se aplica a si e ao seu bairro.

1. Existe uma taxa de criminalidade elevada no meu bairro.			
1 discordo totalmente	2 discordo	3 concordo	4 concordo totalmente
2. A taxa de criminalidade no meu bairro faz com que seja inseguro fazer caminhadas <u>durante o dia</u>.			
1 discordo totalmente	2 discordo	3 concordo	4 concordo totalmente
3. A taxa de criminalidade no meu bairro faz com que seja inseguro fazer caminhadas <u>durante a noite</u>.			
1 discordo totalmente	2 discordo	3 concordo	4 concordo totalmente