Older Surinamese migrants in the Netherlands

Neighbourhood age-friendliness, health behaviours and well-being

Ranisha Warsha Jagroep

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1 General introduction

GENERAL INTRODUCTION

Older Surinamese adults in the Netherlands

People of Surinamese ancestry form one of the largest migrant groups in the Netherlands [1]. In 2023, almost 13% of the older population (65 years and older) in the Netherlands had a Surinamese background [1]. The majority of older Surinamese migrants live in one of the four major cities in the Netherlands (Amsterdam, Rotterdam, the Hague and Utrecht) [2].

Surinam is a former Dutch colony located on the north-eastern Atlantic coast of South America that gained independence in 1975. Surinamese migrants arrived in the Netherlands in two main waves, seeking either higher education and employment or escape from political unrest, respectively [3]. The population of Surinam is heterogeneous in culture and geographic origin, and includes people of Chinese, Javanese, Creole (West African) and Hindustani (Indian) descent [4]; the Surinamese population in the Netherlands is comprised primarily of individuals with the latter two backgrounds. Each of these ethnic groups has unique traditions, norms, values and customs that they brought from their original countries or that developed in Surinam [5]. Creoles have a rich cultural heritage with strong influences from West Africa, which are reflected in their music, dance, spiritual practices and culinary traditions. Creole art forms such as kawina music and winti religion are important aspects of their cultural identity [6, 7]. Hindustani have a strong cultural bond with India, retaining traditions such as Hinduism, Indian languages, music and dance [7]. Their religious festivals and customs, such as Diwali and Holi, are important pillars of their cultural identity [8]. Javanese maintain traditional Javanese customs, such as wayang theatre, gamelan music, batik and other Javanese art forms. A central value among Javanese is 'rukun', which can be translated as harmony or togetherness. This harmony between people is also achieved by holding ritual sacrificial meals known as slametans [9]. The Chinese community in Surinam has a rich cultural heritage with traditional Chinese customs, such as Chinese New Year celebrations, traditional Chinese medicine and Chinese cuisine [10]. In general, most Surinamese speak Dutch fluently, as it is an official language of Surinam and is used in education, government, and the media; this characteristic distinguishes older Surinamese migrants from other migrant groups such as older Moroccan or Turkish older migrants.

Older Surinamese people have worse health compared to the native Dutch population. For example, they are more likely to suffer from chronic diseases (e.g. type 2 diabetes mellitus) [11-14] and psychological distress [15]. In addition, the presence of multiple chronic diseases is more prevalent among Surinamese than native Dutch individuals [16]. According to a recent literature review, only a few

studies of the well-being of older migrants have been conducted in the Netherlands; the included studies were focused on older adults of Turkish and Moroccan descent, while none addressed the well-being of older Surinamese [17].

The neighbourhood

The majority of Dutch neighbourhoods that were built after the Second World War are no longer suitable for the current population. Residential complexes are constructed primarily for average families (mother, father, and two children); consequently, neighbourhoods are unprepared for the increasing number of older adults, including older migrants [18]. The Dutch government encourages older people to live independently at home for as long as possible; consequently, the neighbourhood is an important setting in which to grow old.

Large cities in the Netherlands have a multicultural composition of their societies, in which each group has its own particular needs and preferences in terms of ageing in the neighbourhood [17, 19]. Culture impacts an individual's attitude towards health behaviours [20, 21], interactions with the neighbourhood [22], and well-being [23, 24], and also influences how society defines these concepts and the social status of older adults [25]. Thus, understanding neighbourhood age-friendliness to promote health behaviours and optimize well-being is impossible without understanding particular cultures. This dissertation will focus on the experiences of older Surinamese adults regarding neighbourhood age-friendliness, health behaviours, and well-being.

Age-friendly neighbourhoods

Age-friendly neighbourhoods are environments in which older adults are actively involved, valued, and supported; and that offer physical and social resources and services that accommodate their needs, and thereby promote health and well-being effectively [26]. The interaction between older adults' needs and neighbourhood age-friendliness is dynamic and impacts well-being [27-30]. Well-being encompasses both emotional and functional aspects, entailing not just the experience of positive emotions like happiness and contentment, but also the actualization of personal capabilities, the presence of autonomy and control over one's life, the pursuit of meaningful goals, and the cultivation of positive and supportive relationships with others [31]. The evaluation of well-being relies on personal standards of judgment, shaped by own perspectives, values, motivational patterns, life experiences, and socio-cultural context [23, 32]. Due to physical, psychological, and social changes (e.g. limited mobility, reduced social networks), older adults are more likely to be dependent on the age-friendliness of their neighbourhoods to engage in healthy behaviours and realize well-being [33]. Additionally, a safe,

convenient, and barrier-free neighbourhood can facilitate their adaptation to age-related changes and contribute to their well-being [33].

In the Netherlands, older migrants are more likely to live in disadvantaged and less well-maintained neighbourhoods than older native adults [34, 35]. In general, such neighbourhoods have poor housing conditions and reduced access to physical and social resources and services. Language and structural barriers such as discrimination and racism may adversely impact how older migrants experience their neighbourhood's age-friendliness [36, 37]. Conversely, the availability of ethnic communal resources (e.g. ethnic amenities) and informal sources of support in neighbourhoods with high concentrations of ethnic groups may enhance the experiences of older migrants with their neighbourhood's age-friendliness [38]. In the context of an ageing population, researchers, service providers, and policy makers are increasingly aware of the importance of building and maintaining age-friendly neighbourhoods. However, the perceptions of older Surinamese migrants in the Netherlands regarding neighbourhood age-friendliness and whether and how age-friendly neighbourhoods facilitate healthy behaviours and realize well-being have heretofore remained unknown.

Health behaviours

Healthy behaviours confer well-known benefits to health and well-being [39-42]. A growing body of literature shows that neighbourhoods may provide both potential opportunities and barriers to engaging in a healthy lifestyle by either promoting or impeding healthy behaviours [43]. A lack of age-friendly neighbourhood resources may foster unhealthy behaviours and decrease levels of health and well-being. For example, sidewalks in poor condition or located disproportionately among neighbourhoods may compromise the walking activity of older adults [44, 45].

Engaging in healthy behaviours may be influenced by certain cultural and social beliefs and/or values [46, 47]. For example, beliefs regarding diet vary widely between countries, and can be influenced by social customs, religion, and shared cultural values [48]. Thus, the relationship between health behaviours and the well-being of older migrants might differ from that of the general older population. Engaging in healthy behaviours clearly improves the well-being of the general older population; however, the current literature lacks evidence of this relationship among older Surinamese migrants in the Netherlands. Insight into the relationship between health behaviours and the well-being of older Surinamese adults may facilitate the development of policies that are aligned with the older Surinamese population in the Netherlands to thereby promote health behaviours and subsequent well-being.

Neighbourhood-based interventions to promote health and/or well-being among older migrants

Health and well-being among older adults can be improved by neighbourhood-based interventions [49, 50]. The Dutch government encourages healthy lifestyles and environments. The National Institute for Public Health and the Environment helps municipal policymakers and professionals improve/maintain the health and well-being of residents by implementing neighbourhood-based interventions [51]. These interventions are assessed by independent scientific and functional experts regarding their effectiveness (using elements which ensure that the interventions are successful), and their use is subsequently encouraged to optimize health and well-being. Although culturally sensitive interventions might lead to higher effectiveness due for example to fewer dropouts among participants [52, 53], they are offered infrequently to older migrants in the Netherlands. Culturally sensitive interventions promoting the health and/or well-being of older migrants are lacking both globally and in the Netherlands [53-56]. Additionally, little is known about which approach is most effective under particular circumstances. Thus, research regarding the needs of older migrants in their neighbourhoods is necessary to develop effective interventions to maintain/promote well-being.

The main objective of this dissertation is to examine the importance of neighbourhood age-friendliness in the promotion of health behaviours and optimization of well-being among older Surinamese adults in the Netherlands.

The research aims are:

1. To identify promising neighbourhood interventions to promote the health and well-being of older migrants.
2. To identify the relationship between neighbourhood age-friendliness and physical activity among older Surinamese adults.
3. To identify the relationship between health behaviours and the well-being of older Surinamese adults.
4. To identify how older Surinamese adults experience the age-friendliness of their neighbourhood and how they realize well-being.

Dissertation outline

Chapter 2 provides a systematic review assessing promising neighbourhood-based behavioural change interventions to promote the health and/or well-being of older migrants. The objective of this Chapter was to identify promising neighbourhood interventions to promote the health and well-being of older migrants. Chapters 3 and 4 describe the relationships of neighbourhood age-friendliness with health behaviours and well-being by using cross-sectional survey data. The study in Chapter

3 aimed to identify the relationship between neighbourhood age-friendliness and physical activity among older Surinamese. The research presented in Chapter 4 aimed to identify the relationship of older Surinamese adults' health behaviours with their well-being. Although the association of neighbourhood resources with the well-being of older adults is widely acknowledged, a clear understanding of how older Surinamese adults experience their neighbourhood resources to optimize their well-being is lacking. Chapters 5 and 6 describe studies concerning neighbourhood resources and well-being to identify how older Surinamese adults experience the age-friendliness of their neighbourhood and how they realize well-being. As the COVID-19 pandemic has disproportionately impacted some segments of the Dutch population, such as older Surinamese adults, Chapter 5 provides an interview-based description of their neighbourhood experiences in general and during the pandemic. The relative importance of neighbourhood resources is described in Chapter 6. Chapters 5 and 6 propose that older Surinamese adults require various neighbourhood resources for their well-being realization. Chapter 7 contains an overall discussion of the main findings of this dissertation; theoretical and methodological considerations; implications for policy; and recommendations for future research.

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2 Behaviour change interventions to promote health and well-being among older migrants: A systematic review

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ABSTRACT

Background: Whether behaviour change interventions are effective for the maintenance of older migrants' health and well-being is uncertain. A systematic review was conducted to assess evidence for the capacity of behaviour change techniques (BCTs) to promote the health and well-being of older migrants.
Methods: Electronic databases (Cochrane CENTRAL, Embase, Ovid MEDLINE and Web of Science) were searched systematically to identify relevant randomised controlled trials, pre–post studies and quasi-experimental studies published before March 2021. Additional articles were identified through citation tracking. Studies examining BCTs used to promote the health and/or well-being of older migrants were eligible. Two independent reviewers used the Behaviour Change Technique Taxonomy version 1 to extract data on BCTs. Data on intervention functions (IFs) and cultural adaption strategies were also extracted. Intervention contents (BCTs, IFs, culture adaption strategies) were compared across effective and ineffective interventions according to health and well-being outcome clusters (anthropometrics, health behaviour, physical functioning, mental health and cognitive functioning, social functioning and generic health and well-being).
Results: Forty-three studies (23 randomised controlled trials, 13 pre–post studies and 7 quasi-experimental studies) reporting on 39 interventions met the inclusion criteria. Thirteen BCTs were identified as promising for at least one outcome cluster: goal-setting (behaviour), problem-solving, behavioural contract, self-monitoring of behaviour, social support (unspecified), instruction on how to perform the behaviour, information about health consequences, information about social and environmental consequences, demonstration of the behaviour, social comparison, behavioural practice/rehearsal, generalisation of a target behaviour and addition of objects to the environment. Three BCTs (instruction on how to perform the behaviour, demonstration of the behaviour, and social comparison) and two IFs (modelling and training) were identified as promising for all outcome clusters.
Conclusions: Thirteen distinct BCTs are promising for use in future interventions to optimise health and well-being among older migrants. Future research should focus on the effectiveness of these BCTs (combinations) in various contexts and among different subgroups of older migrants, as well as the mechanisms through which they act. Given the scarcity of interventions in which cultural adaption has been taken into account, future behavioural change interventions should consider cultural appropriateness for various older migrant (sub)groups.

INTRODUCTION

Globally migration occurs due to a range of factors such as political unrest, unemployment, colonial factors and displacement related to conflict [1]. Although migration is not a recent phenomenon, it has been an important part of human history. According to the Population Division of the United Nations, the global number of international migrants increased by 60 million between 2010 and 2020 [2]. Older adults are overrepresented among international migrants, compared to the total population; in 2020 globally 12% of international migrants were at least 65 years old, compared to 9% of the total population [2].

'Migrant' is an umbrella term that refers to "a person who moves away from his or her place of usual residence, whether within a country or across an international border, temporarily or permanently" ([3], p. 132). Research in the interdisciplinary field of ageing and migration generally differentiates groups of migrants, such as guest workers (e.g. Turks and Moroccans in Western Europe), people from former colonies (e.g. Indians and Pakistanis in the UK, Indonesian and Surinamese in the Netherlands), and labour migrants (e.g. Mexicans and Caribbeans in the US) [4, 5]. Older migrants in these groups have the common characteristics of having migrated at relatively young ages, having spent much of their working lives in their host countries, and identification as first-generation migrants (people born in a country other than that of their country of residence) [6-9].

When people migrate, they settle down in a new culture, developing 'migrant identities.' These identities are aspects of people's social identities derived from the sense of belonging to a particular group, culture, and environment [10]. Positive migrant identities buffer against the distress experienced by migrants and seem to be invariant across ethnicities [11-14]. Migrant identities are essential for the well-being of people experiencing other cultures [15]; indeed, they seem to be associated positively with health and well-being [16-18]. They can be seen as an aspect of acculturation, which involves physical, psychological, cultural, and social changes (e.g. learning a new language, establishing new social connections, shifting old cultural expectations) as people adjust to the cultures of their host countries [19]. Individuals create migrant identities in societies in four ways: 1) through strong identification with both groups, indicative of integration; 2) through identification with neither group, suggesting marginalization; 3) through exclusive identification with the majority culture, indicating assimilation; and 4) through identification with only the minority group, reflecting separation [20]. For older migrants, this process involves cross-cultural adjustment and dealing with ageing in a foreign country. A majority of migrants experience acculturative stress and difficulties with their identities due to the pressure to assimilate

while maintaining cultural roots; identification with two different groups may be challenging for ethnic minority group members because of conflicts in attitudes, values, and behaviours [21, 22]. Irrespective of how migrants identify themselves, their home and host cultures seem to have impacts on their lives, depending on the context [23]. Given that culture varies across groups and within the same group and individual, cultural appropriateness should be considered when migrants are involved [24].

The disease risk profiles of migrant and native populations differ, sometimes in favour of, but usually to the disadvantage of migrants. Well-documented examples are the greater prevalence of coronary disease among people originating from the South Asian subcontinent [25], depression among labour migrants from Morocco and Turkey [26], and stroke among people originating from Africa [27]. Mental disorders are common in a large share of migrant populations [28, 29]. This manifestation has been related to the feelings of rejection in host countries, social exclusion, and discrimination that these populations may face [6, 30-33]. Perceived discrimination also seems to negatively affect migrants' health and well-being [34-39], and has been related to higher levels of stress and unhealthy behaviours [33, 40, 41]. Older migrants are especially vulnerable, given that they tend to have more chronic diseases, lower levels of self-rated health and functioning, more limitations in daily activities, and higher rates of depressive symptoms compared with their native counterparts [42-50], which might have an impact on their quality of life [51]. The maintenance of healthy behaviours such as physical activity (PA) and healthy eating is known to be beneficial for physical health, mental health, and well-being [52-57].

Although migrants are expected to differ in some aspects, depending on their country of origin, there are also similarities for the migrant population in general. Older migrants are more likely than their native counterparts to be disadvantaged in terms of socio-economic status (SES) due to lower educational levels, un/underemployment and, often, responsibilities to relatives abroad [58-61]. Low SES has been shown to result in poorer health [62], well-being [63, 64] and unhealthy behaviours [65, 66], and thus less overall health [67].

On arrival in a variety of countries, migrants are widely acknowledged to have an initial health advantage over the native population, known as the 'healthy migrant effect' [68-75]. A vast body of empirical literature, however, shows that the initial health advantage diminishes over time [50, 76]. Migrants acquire disadvantages over the life course, both early life conditions in the country of origin, as well as exposure to challenging situations in the country of destination in terms of poor economic and social conditions. These economic and social conditions are further enforced by cultural and language barriers, homesickness, discrimination

and stigmatization [77-79], which erases the initial health advantage and creates a decline over time in migrants' health status [58].

Next, for older migrants ageing takes place in a second language environment. This poses extra cultural, social, and health-related challenges when mastery of the second language is low. Inadequate health literacy [80, 81], language differences [82-84] and, sociocultural factors [85, 86] may be informal barriers to physical and mental health services access. Low language proficiency also affects individuals' health behaviours [87] because the ability to find and understand health information is associated with the ability to make appropriate health-related decisions [88].

Finally, accessing physical and mental health services is challenging for older populations in general [89-91], however, research indicates that it is more challenging for older migrants due to barriers associated with language, discrimination, health beliefs, the lack of culturally appropriate programs, knowledge of the health care system, and awareness of available health services [47, 92-97]. These factors may result in the underutilization of essential health services [98-100], eventually leading to an increase in illness, lower levels of well-being, multimorbidity, disability, and mortality [82, 101-103]. Given these commonalities, this systematic review focused on the global population of older migrants.

People's health and well-being depend heavily, but not solely, on health behaviours; for instance, PA results in improved cardiovascular health, lower blood pressure, increased muscular strength, decreased depression and improved quality of life [104]. A healthy diet helps to prevent many diseases, such as diabetes [105], coronary heart disease [106] and cancer [107]. Social behaviours, such as social participation and social activities, also improve health and well-being [108-111]. These examples illustrate how health behaviours are relevant to health and well-being, and in turn depend on behaviour choices [112]. These choices, such as being (more) active and having a healthy diet, are not always easily accomplished or maintained. Moreover, engagement in healthy behaviours differs across migrant groups, due for example to cultural factors such as PA patterns and dietary habits, and individual factors such as language proficiency [113-115]. The challenge is to find appropriate means of supporting older migrants' adoption of healthy behaviours.

Behaviour change interventions (BCIs) have received considerable attention, given their potential to promote healthy behaviours, such as the adoption of a healthy diet [116, 117], adequate PA [118] and social activity [119]. BCIs can be defined as coordinated sets of activities designed to change specific behaviour patterns [120], and have the potential to improve health and well-being [121]. BCIs have observable, replicable and irreducible components designed to alter or

redirect behaviour, known as behaviour change techniques (BCTs) [120]. BCTs are relevant across behaviours and outcomes, as they are not specifically applicable to single outcome measures. The identification of BCTs aids the assessment of the effectiveness of intervention components targeting several outcome measures. Several reviews have examined associations between BCTs and intervention effects, identifying various effects [116-119, 122]. Increasing numbers of BCTs are not necessarily associated with better outcomes [116], but combinations of BCTs might increase the effectiveness of interventions [122]. Yet, no existing evidence indicates which BCTs optimise older migrants' health behaviours and, consequently, their health and well-being.

A useful start in addressing this issue and identifying potentially effective components is to specify the BCTs used in interventions. BCT taxonomies are developed with the aim of establishing a sound basis for the description of the procedures involved in interventions, without additional assumptions about BCTs, and ultimately of guiding the development of future behaviour change interventions [123]. Michie and colleagues [124] developed the Behaviour Change Technique Taxonomy version 1 (BCTTv1), a comprehensive taxonomy which describes distinct techniques that may be used to change behaviour, together with nine individual functions that any intervention may provide [120]. Michie and colleagues propose that the classification of distinct BCTs and functions within interventions enables the determination of how interventions operate and thus of which components might be integrated into new and more effective interventions [120, 124, 125].

Previous research has indicated that intervention effectiveness may be improved by tailoring programmes to the relevant populations (e.g. by taking culture into account) [126-128], but current systematic reviews focus mainly on the health and well-being of the general older population, and not specifically on older migrants [129-133]. Older migrants comprise a vulnerable group in society in terms of the maintenance of health and well-being. Behaviour change interventions have the potential to positively affect health behaviours. The identification of intervention components such as BCTs that can effectively change behaviours can guide future intervention development, thereby improving the health and well-being of vulnerable groups such as older migrants. To our knowledge, no systematic review to date has explored BCIs targeting the health and/or well-being of older migrants; thus, we conducted this review of existing empirical research on the topic. Its aim was to identify promising BCTs that are components of effective BCIs that promote the health and/or well-being of older migrants, with consideration of the cultural adaption of interventions. The findings will facilitate the development of effective BCIs for this population.

METHODS

This systematic review was registered with the International Prospective Register of Systematic Reviews (PROSPERO, registration number CRD4201811285), and was conducted and reported following the Preferred Reporting Item for Systematic Reviews and Meta-Analyses (PRISMA) statement (Appendix Table1) [134].

The definition of older individuals varies among countries [135] and between natives and migrants [136]. In most high-income countries, the cut-off of 65 years is used to demarcate older age, but this threshold is not suitable for older migrants. In most Asian countries, people aged ≥ 45 years are considered to be old. In general, migrants report 'feeling old' at younger ages relative to their native counterparts [137], which is related to their hard lives and work, and low educational levels. To maintain consistency with international studies [138-140], we used the cut-off age of 45 years to define older individuals.

For the present review, the definition of migrant was based on that provided by the International Organization for Migration: 'any person who is moving or has moved across an international border or within a State away from his/her habitual place of residence, regardless of the person's legal status, whether the movement is voluntary or involuntary, what the causes for the movement are, or what the length of stay is' [141]. As this review focused on international migrants, we did not consider individuals who migrated within states.

Search strategy

We conducted a systematic search of reports on BCIs implemented with older migrants. Studies were identified initially by searches of the Cochrane CENTRAL, Embase, Ovid MEDLINE and Web of Science electronic databases from inception to March 2021 using keywords referring to BCIs, older migrants (age ≥ 45 years), health and well-being. Details of the searches are provided in Table 2 of the Appendix. Additionally, references cited in identified reviews were screened for eligibility. No limitation on the date of publication was imposed.

Data collection and analysis

Selection of studies

Studies that were eligible for inclusion met the following criteria: 1) focus on BCIs to promote health and/or well-being; 2) targeting of individuals aged 45 years and older; 3) inclusion of migrants; 4) randomised controlled trial, pre–post study, or quasi-experimental design; and 5) written in English.

Data extraction and management

All identified articles were downloaded to the reference management software Endnote X6.0.1. Duplicate reports were excluded, and the titles and abstracts of the remaining articles were assessed for relevance. The inclusion criteria were then applied to exclude ineligible articles. Additionally, identified reviews were screened for potentially relevant references. The full texts of the eligible articles were then retrieved and subjected to full review. Two reviewers (JMC and WJ) independently performed the study selection. Discrepancies regarding eligibility were resolved by discussion and consensus. The following data were extracted from the final set of selected articles and entered into an Excel spreadsheet (Microsoft Office Professional Plus 2013): author(s), title, year of publication, aim, ethnicity of participants (definition of migrant), age range, study design, data collection/follow-up (method and period), loss to follow-up (number and reasons), intervention details [country, setting, content, function, BCT, level (individual or group), cultural adaption, intensity], behaviour change theory/model used, method(s) used to assess health and well-being and corresponding results. *P* values for mean changes between baseline and follow-up(s) were extracted, with effect sizes when available. Effects were interpreted as small (Cohen's $d \geq 0.2$), medium ($d \geq 0.5$) and large ($d \geq 0.8$) [142].

Study quality and risk of bias assessment

The same two reviewers who assessed study eligibility (JMC and WJ) assessed the methodological quality of the studies using the seven domains (random sequence generation, random allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selection outcome reporting and other sources of bias) provided in the Cochrane Handbook [143] for randomised controlled trials (Appendix Table 3). Each domain was rated according to the risk of bias (high, low or unclear). Studies were considered to be highly susceptible to bias when two or more of the seven domains showed susceptibility to bias, three or more domains had unclear risks, or one domain showed susceptibility to bias and two domains had unclear risks. Eleven studies showed susceptibility to bias [144-154], three studies had a moderate risk of bias [155-157] and nine studies had a low risk of bias [158-166].

The Newcastle-Ottawa Scale (NOS) [167] for cohort studies was used to assess the quality of non-randomised trials (S4 Table). Points were allocated for the three domains of selection, comparability and outcome (maximum, 9 points). The risk of bias was categorised as high (0–3 points), moderate (4–6 points) or low (7–9 points). The strength of the evidence for each intervention was assessed using predefined criteria adapted from the Center for Evidence-Based Medicine's levels

of evidence [168] (Appendix Table 3 and Table 4). Eleven studies had a moderate risk of bias [169-179] and eight studies had a low risk of bias [180-187].

Intervention functions

Descriptions from the behaviour change wheel [120] were used to code each intervention as serving one or more of the following nine functions: 1) coercion (creating the expectation of punishment or cost), 2) education (increasing knowledge or understanding), 3) enablement [increasing means/reducing barriers to increase capability (beyond education and training) or opportunity (beyond environmental restructuring)], 4) environmental restructuring (changing the physical or social context), 5) incentivisation (creating the expectation of reward), 6) modelling (providing an example for people to aspire to or imitate), 7) persuasion (using communication to induce positive or negative feelings or stimulate action), 8) restriction [using rules to reduce the opportunity to engage in the target behaviour (or to increase the target behaviour by reducing the opportunity to engage in competing behaviours)] and 9) training (imparting skills). For example, an intervention involving the provision of information to promote healthy eating was coded as having an 'education' function. Each intervention could involve more than one of the nine functions.

Cultural adaption

To identify culturally adapted interventions, Kreuter and colleagues' work describing strategies to promote culturally appropriate health promotion programmes and materials was used [188]. Five categories were distinguished: 1) peripheral strategies that improve programme/study materials' visual appeal to the target population (i.e. by using certain colours, images or fonts), 2) evidential strategies that enhance the perceived relevance of a health issue for a given group by raising awareness and providing facts on the importance of a health condition for that group, 3) linguistic strategies to improve the accessibility of programmes/materials by providing them in the dominant or native language of the target population, 4) constituents-involving strategies that draw directly on the experience of members of the target population (i.e. by hiring indigenous staff members, involving community members in programme development and delivery) and 5) socio-cultural strategies by which health-related issues are discussed in the context of broader social and/or cultural values and characteristics of the target population.

BCTs coding and analysis

The BCTTv1 provides consensus definitions and labels for 93 distinct BCTs organised hierarchically into 16 clusters: 1) goals and planning, 2) feedback and

monitoring, 3) social support, 4) shaping knowledge, 5) natural consequences, 6) comparison of behaviour, 7) associations, 8) repetition and substitution, 9) comparison of outcomes, 10) reward and threat, 11) regulation, 12) antecedents, 13) identity, 14) scheduled consequences, 15) self-belief and 16) covert learning [124]. The taxonomy also includes detailed coding instructions enabling the identification and precise description of technical intervention components that elicit behaviour changes (e.g. physical activity, diet). According to its authors, the BCTTv1 is a trustworthy tool for the extraction of details about intervention content, and the identification and synthesis of distinct and replicable (combinations of) potentially active ingredients related to effectiveness [124]. The BCTTv1 was developed for the organisation of information about behaviour change interventions, rather than to illustrate behaviour in a real-time context [189]. In addition, it enables the investigation of how other factors, such as the mode of delivery, intervention intensity, target behaviour and target population, may make BCTs more or less effective [125]. The BCTTv1 guides the characterization of intervention content to facilitate intervention implementation, delivery and evaluation, with the synthesis of evidence at the BCT level [116-119]. Trained coders can apply the BCTTv1 to identify BCTs from intervention descriptions reliably (in consensus with each other and over time) and validly (as assessed by agreement with experienced coder consensus) [190]. BCTTv1 codes were assigned to intervention components. BCTs in intervention and control groups were identified separately, and BCTs applied exclusively in the intervention groups were extracted. This approach was used to explain differences in effects, as described by Peters and colleagues [191]. Online training in BCTTv1 use was completed [192], to ensure consistency in data recording, BCT data extraction was duplicated independently (by JMC and WJ) at a level of 10% based on the most comprehensive published intervention descriptions. Freely available published protocols and full manuals were used for the coding procedure when available. Any disagreement in coding was resolved through discussion to reach consensus. Following BCTTv1 coding principles, we extracted BCTs that were definitely (coded ++) or probably (coded +) present to capture all relevant BCTs. For example, when an intervention involved participants' recording of their food intake, the 'self-monitoring of behaviour' BCT was coded as probably present (+). When the intervention manual indicated that participants were asked to record and review their food diaries each week, this BCT was coded as definitely present (++).

As no intervention assessed in the included studies involved the use of a single BCT, we report only on the effectiveness of BCT combinations.

Analysis

Two analyses were completed. First, intervention components covering intervention function, cultural awareness and BCTs, of the included interventions were described. Second, the effectiveness of interventions and links between components and effectiveness were estimated.

Following Gardner and colleagues [121], each extracted outcome variable was classified inductively into one of six outcome clusters: anthropometrics (i.e. weight, blood pressure), health behaviour (i.e. PA, fruit and vegetable intake, social activity), physical functioning (i.e. functional status, activities of daily living, physical impairment), mental health and cognitive functioning (i.e. depressive symptoms, recall), social functioning (i.e. social support, loneliness) and generic health and well-being involving indicators not captured by other clusters (i.e. health-related quality of life, vitality, pain).

Intervention effectiveness was evaluated for each outcome cluster according to the presence of a significant ($p < 0.05$) change in the intervention group. Indices of potential (IPs) for intervention components (percentages with evidence of effectiveness) were computed for each outcome cluster, following Gardner and colleagues [121]. IPs were calculated only for components used in four or more interventions to avoid over-interpretation of scant data. Intervention components with IPs > 50% (indicating that they were present in more effective than ineffective interventions) were deemed 'promising', and those with IPs ≤ 50% were deemed 'not promising'.

The effectiveness of lifestyle interventions is commonly assessed after 3, 6, or 12 months [193]. The impact of intervention content (i.e. in terms of the behaviour targeted, intervention function, cultural awareness and BCTs) on effectiveness was assessed for all included studies and separately for studies providing ≥3 months follow-up data as opposed to shorter than 3 months.

RESULTS

The search for articles related to BCIs promoting health and well-being among older migrants yielded 3313 records, from which 95 full-text articles were retrieved. After application of the eligibility criteria, 43 studies were deemed eligible for inclusion (Figure 1).

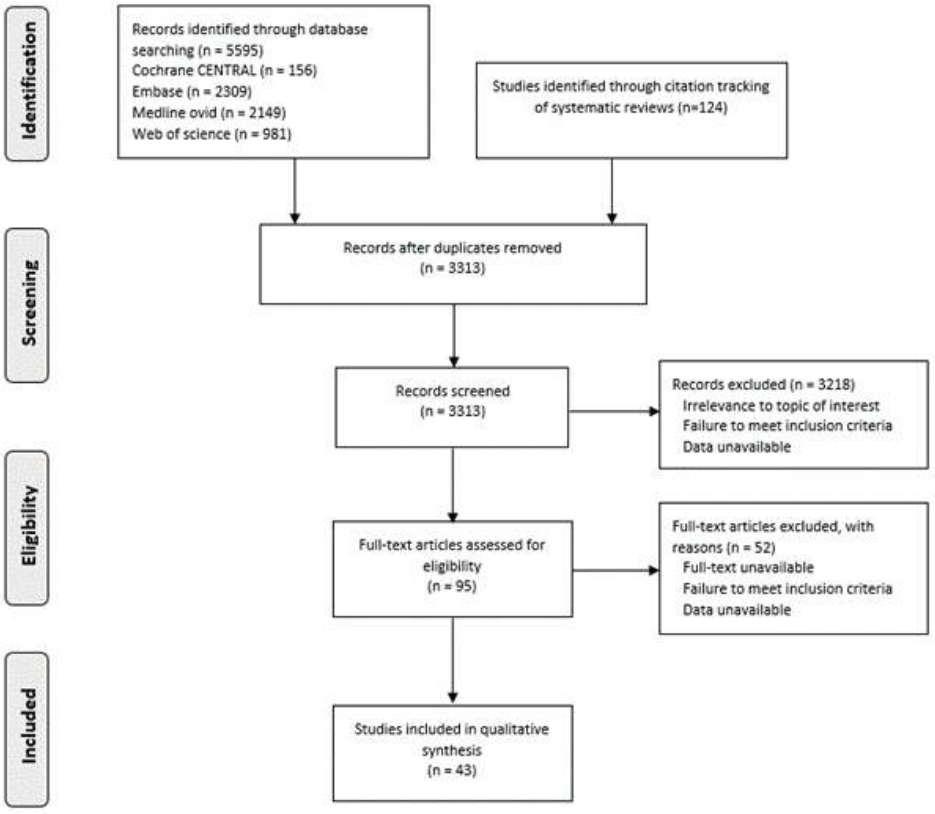

Figure 1. Flowchart of study selection
PRISMA Flowchart for the identification, screening, eligibility and inclusion of studies [134].

Description of the included studies

Tables 1 and 2 summarise study and intervention characteristics; further study details are provided in Table 5 of the Appendix. The reviewed studies were randomised controlled trials (n = 17), cluster-randomised controlled trials (n = 2), parallel design randomised controlled trials (n = 2), two-group randomised controlled trials (n = 1), three-group randomised controlled trials (n = 1), pre–post studies (n = 13) and quasi-experimental studies (n = 7). Three countries were represented, including Canada (n = 3), the Netherlands (n = 1) and the United States (n = 39). The studies included 20–781 individuals, with most of the studies (74%) using a cut-off age of 65 or 70 years. Across all studies, the most common races/ethnicities were Black/African American, Hispanic/Latino, Asian, Chinese and Korean American. Twenty-nine studies [144, 149, 151-156, 158, 161-166, 170, 172-183, 194] involved solely older migrants and four-teen studies [145-148, 150, 157, 159, 160, 169, 171, 184-187] involved older migrants and natives. With the exception of two studies

[159, 169], more than 50% of participants in the latter studies were migrants. Participants' migration backgrounds were defined by birth in a foreign country, proficiency in a language other than the native language of the country in which the intervention was conducted, and self-identification as a migrant. The authors of 30 articles did not mention how participants' migration backgrounds were defined.

Eight interventions were delivered individually [145, 149, 154, 159, 165, 171, 184, 185, 187], 18 were provided in groups [148, 152, 153, 156, 158, 163, 164, 169, 170, 175-180, 182-186, 194] and 13 used a combination of individual and group formats [144, 146, 147, 150, 151, 155, 157, 160-162, 166, 172-174, 181]. Different outcomes of the same interventions were reported separately for the Healthy Habits Program [174, 181], Well Elderly Lifestyle Redesign [146, 160], Experience Corps [147, 157], and Active Choices and Active Living Every Day [184, 185]. For the Healthy Habits Program, Hau et al. [181] build upon Lu et al's [174] pilot study using a community-engaged approach. Several authors reported data from the same study. Clark et al. [146] and Juang et al. [160] reported data from the Lifestyle Redesign intervention, and Manson et al. [175, 176] and Taylor-Piliae et al. [178, 179] described two different tai chi interventions. This resulted in 39 articles reporting on 35 interventions. Manson et al. [176] and Wilcox et al. [185] reported data from previous studies, also included in this review [175, 184].

The number of functions per intervention ranged from one to four. Common functions were education, enablement and persuasion.

Twenty-four interventions implemented cultural adaptions, with four cultural adaption strategies identified. The number of such strategies per intervention ranged from one to three. Most of these studies took the native languages of the participants into account (linguistic strategy).

Of the 93 possible BCTs, 36 were identified in at least one intervention (Appendix Table 5 and Table 6). All BCT clusters except scheduled consequences and covert learning were represented. All interventions included multiple BCTs in various clusters (14 of 19), with all interventions encompassing two or more BCTs. The number of BCTs per intervention ranged from 2 to 15. The most frequently used BCTs were social support (unspecified) and instruction on how to perform the behaviour. Most studies targeted one behaviour, most frequently PA. Eleven studies targeted two behaviours (i.e. PA, healthy diet, social functioning). The authors of 14 studies specified that the interventions were based on behaviour change theories or models [144, 150-152, 156, 161-163, 165, 166, 173, 184-186]. Among all included interventions, 50 BCTs were coded as probably present (+) and 215 BCTs were coded as definitely present (++); Appendix Table 6.

The frequency of contact with participants ranged from 1 to 34 sessions, with nine studies involving individually tailored programmes [144, 146, 151, 152, 154,

160, 162, 171, 187]. Intervention durations were 1 day; 6, 8, 9, 12, 16 and 20 weeks; 6 months; and 1 year. Thirty studies involved single follow-up evaluations, conducted 2 weeks to 2 years after baseline assessments [145, 146, 148-151, 153, 156, 157, 159, 160, 162-166, 169-171, 173, 175-182, 184, 186, 187, 194]. The remaining 13 studies had multiple (two or three) follow-up time points covering periods of 6 weeks to 4 years [144, 152, 154, 155, 157, 158, 161, 172, 174, 178, 179, 183, 185].

Among the 39 interventions assessing health and well-being outcomes, 12 of 16 showed effectiveness for anthropometrics outcomes, and 15 of 17 showed effectiveness for health behaviour outcomes. In addition, effectiveness was shown for 17 of 19 interventions assessing physical function outcomes, 11 of 18 examining mental health and cognitive function outcomes, 8 of 10 social function outcomes and 11 of 18 assessing generic health and well-being.

Assessment of the number of effective interventions among all interventions in each outcome cluster revealed that individually delivered interventions seemed to be less effective for all outcome clusters (one of four individually delivered interventions was effective for anthropometrics outcomes, one of four for health behaviour outcomes, two of three for physical function outcomes, one of three for mental health and cognitive function outcomes, one of four for generic health and well-being outcomes, and no such intervention was effective for social function outcomes). Interventions implemented in group-based sessions (alone or in combination with individual sessions) were most effective for all outcome clusters (9 of 11 group-based interventions were effective for anthropometrics outcomes, 10 of 12 for health behaviour outcomes, 15 of 17 for physical function outcomes, 8 of 13 for mental health and cognitive function outcomes, 8 of 10 for social function outcomes and 9 of 13 such interventions were effective for generic health and well-being outcomes).

Table 1. Summary of intervention characteristics (*n* = 39)

Intervention characteristics		Number of interventions (*n* = 39) (%)
Number of behaviours targeted		
	One behaviour	28 (72%)
	Two behaviours	11 (28%)
Specific behaviours targeted		
	Physical activity	31 (79%)
	Healthy diet	10 (26%)
	Social functioning	6 (15%)
	Blood pressure management	1 (3%)
	Depression management	1 (3%)

Intervention characteristics		Number of interventions (n = 39) (%)
	Health management	2 (5%)
Intervention functions[#]		
	Education	19 (49%)
	Enablement	19 (49%)
	Environmental restructuring	8 (21%)
	Modeling	14 (36%)
	Persuasion	15 (38%)
	Training	16 (41%)
Cultural adaptive interventions[¥]		24 (62%)
	Constituents-involving strategies	4 (17%)
	Linguistic strategies	19 (79%)
	Peripheral strategies	2 (8%)
	Sociocultural strategies	11 (46%)
Setting		
	Community based	5 (13%)
	Community center	8 (21%)
	Home based	6 (15%)
	Local church	5 (13%)
	Public elementary school	1 (3%)
	Senior center	10 (26%)
	Urban hospital	1 (3%)
Delivered by		
	Exercise expert	5 (13%)
	Health care professional	9 (23%)
	Older adult volunteer	1 (3%)
	Peer educator	3 (8%)
	Researcher	2 (5%)
	Trained facilitator	11 (28%)
	Not mentioned	8 (21%)
Evidence of effectiveness, by outcome cluster		
	Anthropometrics (n = 16)	Effective n = 12 Not effective n = 4
	Behaviour (n = 17)	Effective n = 14 Not effective n = 3
	Physical functioning (n = 19)	Effective n = 17 Not effective n = 2
	Mental health and cognitive functioning (n = 18)	Effective n = 11 Not effective n = 7

Intervention characteristics		Number of interventions (*n* = 39) (%)
	Social functioning (*n* = 10)	Effective *n* = 8 Not effective *n* = 2
	Generic health and well-being (*n* = 18)	Effective *n* = 11 Not effective *n* = 7

[#]Definition of intervention functions: *Education*: 'increasing knowledge or understanding'; *Enablement*: 'increasing means/reducing barriers to increase capability (beyond education and training) or opportunity (beyond environmental restructuring)'; *Environmental restructuring*: 'changing the physical or social context'; *Modeling*: 'providing an example for people to aspire to or imitate'; *Persuasion*: 'using communication to induce positive or negative feelings or stimulate action'; *Training*: 'imparting skills' [120].

[¥]Definition of cultural adaption: *Linguistic strategies* improve the accessibility of programs/materials by providing them in the dominant or native language of the target population. *Sociocultural strategies* discuss health-related issues in the context of broader social and/or cultural values and characteristics of the target population [188].

BCTs used in trials characterised as promising

BCTs targeting health and/or well-being, identified from descriptions of interventions in the included articles, are summarised by outcome cluster in Table 2. BCTs used in individual trials are shown in Table 5 and Table 6 of the Appendix.

Anthropometrics outcomes

A total of 12 interventions assessing anthropometrics outcomes resulted in significant improvements [144, 155, 156, 158, 161, 164, 174, 176-179, 184, 185], with most of these interventions targeting PA (Table 2). Five of six identified intervention functions were deemed promising: education (IP = 57%), enablement (IP = 67%), environmental restructuring (IP = 75%), modelling (IP = 83%) and training (IP = 100%). Eight effective interventions implemented cultural adaption strategies, most providing their programmes/materials in participants' native languages (linguistic strategy; IP = 100%). Socio-cultural strategies (i.e. incorporation of traditional cuisine, culturally relevant music; IP = 75%) also showed promising effects. Nine BCTs were identified as promising: problem solving (IP = 57%), self-monitoring of behaviour (IP = 67%), social support (unspecified; IP = 73%), instruction on how to perform the behaviour (IP = 82%), information about health consequences (IP = 56%), demonstration of the behaviour (IP = 86%), social comparison (IP = 80%), behavioural practice/rehearsal (IP = 86%) and addition of objects to the environment (IP = 75%).

Health behaviour outcomes

Effectiveness was shown for 14 of 17 interventions assessing behaviour outcomes [144, 145, 147-149, 157-159, 162, 163, 165, 172, 173, 180-182, 184, 185, 194], with most of these interventions targeting PA. Five intervention functions were iden-

tified as promising, ranging from one to four per intervention. Eight effective interventions included cultural adaption (linguistic and socio-cultural) strategies. In total, 13 BCTs were identified as promising: goal-setting (behaviour; IP = 91%), problem solving (IP = 91%), behavioural contract (IP = 75%), self-monitoring of behaviour (IP = 100%), social support (unspecified; IP = 91%), instruction on how to perform the behaviour (IP = 88%), information about health consequences (IP = 73%), information about social and environmental consequences (IP = 75%), demonstration of the behaviour (IP = 100%), social comparison (IP = 86%), behavioural practice/rehearsal (IP = 100%), and addition of objects to the environment (IP = 100%).

Physical function outcomes

Nineteen BCIs employed physical function outcome measures [146, 147, 150, 153, 159, 160, 163, 164, 166, 170, 171, 173-181, 183, 187]; two interventions resulted in no significant improvement [153, 174]. All interventions targeted PA, except for one which targeted social functioning [147]. All six intervention functions were identified as promising. Fourteen interventions assessing physical functioning involved cultural adaption strategies, most of which were linguistic and socio-cultural. Goal-setting (behaviour; IP = 100%), problem solving (IP = 100%), self-monitoring of behaviour (IP = 100%), social support (unspecified; IP = 89%), instruction on how to perform the behaviour (IP = 93%), information about health consequences (IP = 60%), demonstration of the behaviour (IP = 93%), social comparison (IP = 80%), behavioural practice/rehearsal (IP = 93%), generalisation of a target behaviour (IP = 83%), and addition of objects to the environment (IP = 80%) were identified as promising BCTs.

Mental health and cognitive function outcomes

Eleven interventions resulted in significant progress in mental health and cognitive function outcome measures [146, 153, 160, 161, 163, 170, 171, 174, 178, 179, 181, 183, 184], with most of these interventions targeting PA. Four intervention functions were deemed promising: education (IP = 63%), enablement (IP = 67%), modelling (IP = 67%), and training (IP = 56%). Eleven effective interventions involved cultural adaption strategies, most of which were linguistic and socio-cultural. Problem solving (IP = 56%), social support (unspecified; IP = 58%), instruction on how to perform the behaviour (IP = 67%), information about health consequences (IP = 67%), demonstration of the behaviour (IP = 75%), social comparison (IP = 67%), behavioural practice/rehearsal (IP = 67%), generalisation of a target behaviour (IP = 80%) and addition of objects to the environment (IP = 60%) were identified as promising BCTs.

Social function outcomes

Ten interventions employed social function outcome measures, with eight interventions resulting in significant improvements in social contact, social activities, social support, and loneliness [146, 147, 150, 151, 160, 166, 169, 170, 173, 178, 179, 194]. Most social-function interventions targeted PA. Four promising intervention functions were identified: education (IP = 75%), modelling (IP = 100%), persuasion (IP = 80%) and training (IP = 100%). Five effective interventions included linguistic strategies. Eight BCTs were identified as promising: goal-setting (behaviour; IP = 100%), problem solving (IP = 100%), self-monitoring of behaviour (IP = 100%), social support (unspecified; IP = 80%), instruction on how to perform the behaviour (IP = 89%), demonstration of the behaviour (IP = 86%), social comparison (IP = 83%) and behavioural practice/rehearsal (IP = 78%).

Generic health and well-being outcomes

Eighteen interventions employed generic health and well-being outcome measures, covering aspects such as vitality, life satisfaction, stress, pain and fatigue [146, 151, 153, 154, 159, 160, 163, 164, 169-172, 176-180, 183-186], ten interventions showed to be significant [146, 160, 164, 169, 170, 176-180, 183, 186]. Eleven interventions targeted PA, with education (IP = 60%), modelling (IP = 86%) and training (IP = 83%) identified as promising intervention functions. Linguistic strategies were implemented in most of the effective interventions involving cultural adaption. In total, five BCTs were deemed promising: instruction on how to perform the behaviour (IP = 83%), demonstration of the behaviour (IP = 78%), social comparison (IP = 57%), behavioural practice/rehearsal (IP = 78%) and generalisation of a target behaviour (IP = 79%).

Table 2. Intervention effectiveness by outcome cluster*

Anthropometrics outcomes					
Targeted behaviour		Evidence of effectiveness (*n* = 12)	No evidence of effectiveness (*n* = 4)	All (*n* = 16)	Index of potential**
	Physical activity	**11**	**3**	**14**	**79%**
	Healthy diet	**5**		**5**	**100%**
Intervention functions#					
	Education	**4**	**3**	**7**	**57%**
	Enablement	**3**	**2**	**5**	**60%**
	Environmental restructuring	**3**	**1**	**4**	**75%**
	Modelling	**5**	**1**	**6**	**83%**

	Persuasion	2	3	5	40%
	Training	**6**		**6**	**100%**
Cultural adaption strategies¥		8	1	9	88%
	Linguistic	**6**		**6**	**100%**
	Socio-cultural	**3**	**1**	**4**	**75%**
BCT code	BCT label				
1.1	Goal-setting (behaviour)	3	3	6	50%
1.2	**Problem solving**	**4**	**3**	**7**	**57%**
1.8	Behavioural contract	2	2	4	50%
2.3	**Self-monitoring of behaviour**	**4**	**2**	**6**	**67%**
3.1	**Social support (unspecified)**	**8**	**3**	**11**	**73%**
4.1	**Instruction on how to perform the behaviour**	**9**	**2**	**11**	**82%**
5.1	**Information about health consequences**	**5**	**4**	**9**	**56%**
6.1	**Demonstration of the behaviour**	**6**	**1**	**7**	**86%**
6.2	**Social comparison**	**4**	**1**	**5**	**80%**
8.1	**Behavioural practice/ rehearsal**	**6**	**1**	**7**	**86%**
12.5	**Adding objects to the environment**	**3**	**1**	**4**	**75%**
Health behaviour outcomes					
Targeted behaviour		Evidence of effectiveness (*n* = 15)	No evidence of effectiveness (*n* = 2)	All (*n* = 17)	Index of potential**
	Physical activity	**12**	**2**	**14**	**86%**
	Healthy diet	**5**	**2**	**7**	**71%**
Intervention functions#					
	Education	**7**	**1**	**8**	**88%**
	Enablement	**7**	**2**	**9**	**78%**
	Modelling	**4**		**4**	**100%**
	Persuasion	**8**	**2**	**10**	**80%**
	Training	**6**		**6**	**100%**
Cultural adaption strategies¥		8	1	9	89%
	Linguistic	**6**	**1**	**7**	**86%**
	Socio-cultural	**4**	**1**	**5**	**80%**

BCT code	BCT label				
1.1	**Goal-setting (behaviour)**	**10**	**1**	**11**	**91%**
1.2	**Problem solving**	**10**	**1**	**11**	**91%**
1.8	**Behavioural contract**	**3**	**1**	**4**	**75%**
2.3	**Self-monitoring of behaviour**	**6**		**6**	**100%**
3.1	**Social support (unspecified)**	**10**	**1**	**11**	**91%**
4.1	**Instruction on how to perform the behaviour**	**7**	**1**	**8**	**88%**
5.1	**Information about health consequences**	**8**	**3**	**11**	**73%**
5.3	**Information about social and environmental consequences**	**3**	**1**	**4**	**75%**
6.1	**Demonstration of the behaviour**	**4**		**4**	**100%**
6.2	**Social comparison**	**6**	**1**	**7**	**86%**
8.1	**Behavioural practice/ rehearsal**	**6**		**6**	**100%**
9.2	Pros and cons	2	2	4	50%
12.5	**Adding objects to the environment**	**4**		**4**	**100%**
Physical function outcomes					
Targeted behaviour		Evidence of effectiveness (n = 17)	No evidence of effectiveness (n = 2)	All (n = 19)	Index of potential**
	Physical activity	**15**	**2**	**17**	**88%**
Intervention functions#					
	Education	**6**	**1**	**7**	**86%**
	Enablement	**8**	**1**	**9**	**89%**
	Modelling	**10**	**1**	**11**	**91%**
	Persuasion	**6**		**6**	**100%**
	Training	**6**	**1**	**7**	**86%**
Cultural adaption strategies¥		13	2	15	87%
	Linguistic	**11**	**2**	**13**	**85%**
	Socio-cultural	**6**	**1**	**7**	**86%**
BCT code	BCT label				
1.1	**Goal-setting (behaviour)**	**8**		**8**	**100%**
1.2	**Problem-solving**	**9**		**9**	**100%**
2.3	**Self-monitoring of behaviour**	**5**		**5**	**100%**
3.1	**Social support (unspecified)**	**8**	**1**	**9**	**89%**

4.1	**Instruction on how to perform the behaviour**	**14**	**1**	**15**	**93%**
5.1	**Information about health consequences**	**4**	**2**	**6**	**67%**
6.1	**Demonstration of the behaviour**	**13**	**1**	**14**	**93%**
6.2	**Social comparison**	**4**	**1**	**5**	**80%**
8.1	**Behavioural practice/ rehearsal**	**14**	**1**	**14**	**93%**
8.6	**Generalisation of a target behaviour**	**5**	**1**	**6**	**83%**
Mental health and cognitive function outcomes					
Targeted behaviour		Evidence of effectiveness (n = 11)	No evidence of effectiveness (n = 7)	All (n = 18)	Index of potential**
	Physical activity	**10**	**5**	**15**	**67%**
Intervention functions[#]					
	Education	**5**	**3**	**8**	**63%**
	Enablement	**6**	**3**	**9**	**67%**
	Modelling	**4**	**2**	**6**	**67%**
	Persuasion	1	4	5	20%
	Training	**5**	**4**	**9**	**56%**
Cultural adaption strategies[¥]		10	3	13	77%
	Linguistic	**9**	**2**	**11**	**82%**
	Socio-cultural	**4**	**1**	**5**	**80%**
BCT code	BCT label				
1.1	Goal-setting (behaviour)	3	3	6	50%
1.2	**Problem solving**	**5**	**4**	**9**	**56%**
1.8	Behavioural contract	2	3	5	40%
2.3	Self-monitoring of behaviour	2	3	5	40%
3.1	**Social support (unspecified)**	**7**	**5**	**12**	**58%**
4.1	**Instruction on how to perform the behaviour**	**8**	**4**	**12**	**67%**
5.1	**Information about health consequences**	**4**	**2**	**6**	**67%**
6.1	**Demonstration of the behaviour**	**6**	**2**	**8**	**75%**
6.2	**Social comparison**	**4**	**2**	**6**	**67%**
8.1	**Behavioural practice/ rehearsal**	**6**	**3**	**9**	**67%**

8.6	**Generalisation of a target behaviour**	**4**	**1**	**5**	**80%**
12.5	**Adding objects to the environment**	**3**	**2**	**75**	**60%**
Social function outcomes					
Targeted behaviour		Evidence of effectiveness (*n* = 8)	No evidence of effectiveness (*n* = 2)	All (*n* = 10)	Index of potential**
	Physical activity	**5**	**1**	**6**	**83%**
	Social functioning	**4**	**1**	**5**	**80%**
Intervention functions#					
	Education	**3**	**1**	**4**	**75%**
	Modelling	**4**		**4**	**100%**
	Persuasion	**4**	**1**	**5**	**80%**
	Training	**5**		**5**	**100%**
Cultural adaption strategy¥		5	2	7	71%%
	Linguistic	**3**	**1**	**4**	**75%**
BCT code	BCT label				
1.1	**Goal-setting (behaviour)**	**5**		**5**	**100%**
1.2	**Problem solving**	**4**		**4**	**100%**
2.3	**Self-monitoring of behaviour**	**4**		**4**	**100%**
3.1	**Social support (unspecified)**	**4**	**1**	**5**	**80%**
4.1	**Instruction on how to perform the behaviour**	**8**	**1**	**9**	**89%**
6.1	**Demonstration of the behaviour**	**6**	**1**	**7**	**86%**
6.2	**Social comparison**	**5**	**1**	**6**	**83%**
8.1	**Behavioural practice/ rehearsal**	**7**	**1**	**8**	**88%**
Generic health and well-being outcomes					
Targeted behaviour		Evidence of effectiveness (*n* = 11)	No evidence of effectiveness (*n* = 7)	All (*n* = 18)	Index of potential**
	Physical activity	**10**	**5**	**15**	**67%**
Intervention functions#					
	Education	**6**	**4**	**10**	**60%**
	Enablement	4	5	9	44%
	Modelling	**6**	**1**	**7**	**86%**
	Persuasion	3	4	7	43%

	Training	**5**	**1**	**6**	**83%**
Cultural adaption strategy[¥]		7	5	12	58%
	Linguistic	**6**	**3**	**9**	**67%**
BCT code	BCT label				
1.1	Goal-setting (behaviour)	3	4	7	43%
1.2	Problem solving	4	4	8	50%
1.8	Behavioural contract	1	4	5	20%
2.2	Feedback on behaviour	1	3	4	25%
2.3	Self-monitoring of behaviour	1	3	4	25%
3.1	Social support (unspecified)	5	6	11	45%
4.1	**Instruction on how to perform the behaviour**	**10**	**2**	**12**	**83%**
5.1	Information about health consequences	3	3	6	50%
6.1	**Demonstration of the behaviour**	**7**	**2**	**9**	**78%**
6.2	**Social comparison**	**4**	**3**	**7**	**57%**
8.1	**Behavioural practice/ rehearsal**	**7**	**2**	**9**	**78%**
8.6	**Generalisation of a target behaviour**	**6**	**2**	**8**	**75%**
12.5	Adding objects to the environment	1	3	4	25%
15.1	Verbal persuasion about capability	2	2	4	50%

BCT, behaviour change technique

*Only characteristics identified in at least four interventions within each cluster are reported for that cluster.

** Among all interventions featuring the focal characteristic, the percentage of interventions showing evidence of potential effectiveness for at least one variable in the relevant outcome cluster. Entries in bold are components found to show promise (index of potential > 50%).

[#]Definitions of intervention functions: education, 'increasing knowledge or understanding'; enablement, 'increasing means/reducing barriers to increase capability (beyond education and training) or opportunity (beyond environmental restructuring)'; environmental restructuring, 'changing the physical or social context'; modelling, 'providing an example for people to aspire to or imitate'; persuasion, 'using communication to induce positive or negative feelings or stimulate action'; training, 'imparting skills' (ref. [120], p. 7).

[¥] Definitions of cultural adaption strategies: linguistic, improving programme/materials accessibility by providing them in the dominant or native language of the target population; socio-cultural, discussing health-related issues in the context of broader social and/or cultural values and characteristics of the target population (ref. [188], p. 135-136.

BCTs used in trials involving assessment ≥3 months after baseline characterised as promising

The impacts of interventions involving assessment ≥3 months after baseline on effectiveness are summarised in Table 7 of the Appendix. Of the 27 interventions in this category [144-147, 150, 155, 157-161, 163-166, 169-172, 174-179, 181-187], 10

were effective assessing anthropometrics outcomes [144, 155, 156, 158, 161, 164, 174, 176, 178, 179, 184, 185]. Nine interventions were effective assessing behaviour outcomes [144, 147, 149, 157-159, 163, 165, 172, 182], 16 for physical functioning [146, 147, 150, 159, 160, 163, 164, 166, 170, 171, 175-179, 181, 183, 187], 10 for mental health and cognitive functioning [146, 161, 163, 170, 171, 174, 178, 179, 181, 183, 184], 6 for social functioning [146, 147, 150, 166, 169, 178, 179] and 9 effective interventions employed generic health and well-being outcomes [146, 164, 169, 170, 176, 178, 179, 183-186]. Only one BCT, instruction on how to perform the behaviour, remained promising in all outcome clusters. Problem solving (IP = 60%), self-monitoring of behaviour (IP = 75%), social support (unspecified; IP = 75%), instruction on how to perform the behaviour (IP = 89%), information about health consequences (IP = 63%) and behavioural practice/rehearsal (IP = 100%) remained promising among the interventions assessing anthropometrics outcomes. Interventions assessing behaviour outcomes employed six promising BCTs: goal-setting (behaviour; IP = 100%), problem solving (IP = 100%), self-monitoring of behaviour (IP = 100%), social support (unspecified; IP = 8%), instruction on how to perform the behaviour (IP = 100%) and information about health consequences (IP = 88%). In interventions assessing physical outcomes and mental health and cognitive function outcomes, all BCTs except social comparison and generalisation of a target behaviour were promising. Only three BCTs were promising in interventions assessing social functioning: instruction on how to perform the behaviour (IP = 86%), demonstration of the behaviour (IP = 80%) and behavioural practice/rehearsal (IP = 83%). All BCTs in the generic health and well-being outcome cluster were promising.

DISCUSSION

The aim of this review was to summarise the current body of literature on BCTs that are present in effective behavioural change interventions which target the health and well-being of older migrants. Thirty-nine BCIs showed mixed effects in health and well-being outcome clusters, and 13 BCTs were identified as promising for at least one outcome cluster. Four BCTs and two intervention functions were identified as promising for all outcome clusters; only instruction on how to perform the behaviour and training remained promising for all outcome clusters ≥3 months after baseline. Twenty-four studies included cultural adaption, most commonly using linguistic and socio-cultural strategies; linguistic strategies were identified as promising for all outcome clusters (except social functioning at ≥3 months after baseline).

Given the lack of previous systematic reviews focusing on older migrants, the results from this study can be compared with systematic reviews of BCTs used to promote health and/or well-being in other populations. Promising BCTs included: goal-setting (behaviour), problem-solving, self-monitoring of behaviour, social support (unspecified), instruction on how to perform the behaviour, demonstration how to perform the behaviour, behavioural practice/rehearsal, information about health consequences, information about social and environmental consequences, behavioural contract, social comparison, generalisation of a target behaviour and adding objects to the environment.

The finding that goal-setting (behaviour), problem solving and self-monitoring of behaviour were promising is in line with results from previous studies [116, 117, 122, 195-197]. The definition of goals, for instance by developing PA plans or by monitoring behaviour using a pedometer or log book, has been associated with better intervention effects in previous research [116, 122, 195, 197]. In contrast, the systematic review conducted by French *et al.* [198] showed a negative association of goal-setting (behaviour) with PA among older individuals. Further research is needed to explore whether this difference in study findings is due to differences in the populations examined or other factors.

Social support (unspecified) has been shown to be effective in promoting healthy behaviours, such as PA [195, 199] and good dietary habits [117, 200, 201]. Older individuals have also reported that social support facilitates participation in PA [202]. Social support from family members and friends may be more important for the initiation of PA among community-dwelling older individuals [203-205], whereas social support from sports professionals, health care providers and exercise group members may be more important for the maintenance of PA [206].

Instruction on how to perform the behaviour has been shown in previous research to be associated with better outcomes of interventions targeting healthy behaviours, such as smoking cessation and PA [116, 118, 207, 208]. Interventions involving such instruction provided, for example, handouts or exercise training, and some also involved information about health, social and/or environmental consequences, which have been identified as promising for the promotion of smoking cessation [207, 209].

To our knowledge, our review showed for the first time that the BCTs of behavioural practice/rehearsal, behavioural contract, social comparison, generalisation of a target behaviour, and addition of objects to the environment can be promising for the promotion of health behaviours. Further research is needed to explore the effectiveness of these BCTs in achieving this goal.

In line with previous research, the results of this systematic review suggest that group-based interventions are more effective than individually delivered interventions [210, 211].

Previous research has indicated that people from disadvantaged backgrounds are less successful in achieving behaviour changes (e.g. cessation of smoking) following participation in formal programmes than less disadvantaged socioeconomic groups [212]. However, Michie and colleagues [213] indicated that BCIs can be effective among individuals with such backgrounds. They proposed that a small set of BCTs may be more effective for this part of the population than would interventions combining large numbers of different BCTs. In contrast to other literature showing that BCT combinations are more likely to show effectiveness in promoting healthy behaviour, suggesting that greater numbers of BCTs are associated with increased intervention effectiveness [197, 214-216]. The BCTs that we identified as promising may work differently for older migrants than for native older individuals. We cannot draw specific conclusions about comparative intervention effectiveness in these two populations because most interventions included in this review targeted older migrants.

The number of behaviours targeted might also impact intervention effectiveness; in this systematic review, 11 of 35 interventions targeted two behaviours. Efforts to change multiple behaviours simultaneously, rather than changing behaviours individually, have been found to be more effective in changing at least one behaviour [217]. Precisely how this process works is unclear, but it has been proposed that a successful change in one behaviour can enable change in other behaviours, and that the targeting of behavioural patterns may be more suitable [218]. For example, Schölmerich and Kawachi [219] suggest that multi-level interventions (which target change at levels including policy, community, organisational, interpersonal and intrapersonal) exert the strongest effects on health outcomes. The implementation of health behaviour interventions is a complex process; more insight is needed on the optimal number of BCTs to implement and behaviours to target for the promotion of health behaviour among older migrants.

Four-teen research groups reported the use of eight behaviour change theories and models to underpin interventions in the articles included in this review; research has shown that theory-driven interventions are more effective [216, 220-223]. Although, the reasons for the incorporation of some BCTs in interventions were not always clear, our findings show that a variety of BCTs can be implemented to improve the health and/or well-being of older migrants. These findings reflect the heterogeneity of BCTs and technical intervention formats that can effectively promote health and/or well-being among older migrants.

This review showed mixed results for intervention effectiveness among outcome clusters. First, several interventions had no impact on anthropometric [145, 154, 159, 173], health behaviour [145, 148, 181], physical function [153, 174], mental health and cognitive function [147, 151, 152, 159, 180, 184, 187], social function [151, 170] and/or generic health and well-being [151, 153, 159, 163, 171, 172, 184, 185] outcomes, highlighting the possibility that BCIs will fail and emphasising the importance of identifying intervention components that may contribute to effectiveness [224]. However, the identification of effective BCTs is difficult, given the pool of different combinations of BCTs within and across studies. Second, more than half of the interventions were effective for each outcome cluster in this review, in contrast to a previous study in which less than half of the interventions effectively enhanced health and well-being outcomes [121]. An explanation for this difference might be publication bias among included articles, or our definition of a promising BCT based on positive effects in at least one outcome in a cluster, which may have led to the overestimation of effectiveness. For instance, two interventions with promising BCTs each changed only one of four health behaviours [147, 157, 159] or social function outcomes [147, 157]. Reasons for the mixed results may be the lack of clarity about key intervention components [225], lack of a theoretical framework [226] and/or use of inappropriate BCTs for the target population [227].

Most of the included interventions targeted PA, with three interventions addressing social functioning. Social functioning is an important social determinant of health (i.e. social participation, loneliness) and has impacts on health outcomes (i.e. health-related quality of life, cognitive impairment, dementia, depression and mortality) [108-111]. Previous research has indicated that interventions addressing social participation, social isolation and loneliness in community-dwelling ethnic minority groups can be effective [228]. Our review highlights the importance of investing in the development and implementation of interventions addressing social functioning among older migrants, as we found only a small number of studies on this subject.

Implications for Policy and Intervention Design

This study provides an overview of promising BCTs for six health/well-being outcome clusters, which can be used for intervention development. For example, three BCTs (demonstration of the behaviour, social comparison, and behavioural practice/rehearsal) were promising for all outcome clusters, suggesting that they could be used in the development of interventions targeting older migrants' health and well-being. Behavioural contract establishment and the provision of information about social and environmental consequences were promising only for health behaviour outcomes. Thus, the implementation of these BCTs in BCIs targeting

such outcomes (e.g. PA) would likely be beneficial. In addition, six intervention functions were identified as promising, for all outcome clusters in two cases (education and modeling). Thus, BCIs that increase participants' knowledge and understanding (education) and provide examples for people to aspire to or imitate (modeling) are likely to improve health and well-being among older migrants.

The influence of culture is important to consider in intervention development, as many cultural factors influence people's health-related beliefs [229] and, in turn, might influence their actions and impact intervention effectiveness. For example, previous findings suggest that culture impacts the role of social support with regard to PA [230-232]. Interventions included in this review that involved cultural adaption employed single cultural adaptive strategies Linguistic and sociocultural strategies to make interventions culturally appropriate were found to be promising in this study. This finding suggests that information about an intervention and the materials used therein should be provided in the native language of the target population. In addition, the social and/or cultural values of the target population should be considered when BCIs are developed.

Most studies included in this review were conducted in high-income countries, which resulted in the exclusion of certain countries and migrant groups. This situation has to do partly with funding for migrant research. Funding agencies could aid research efforts by investing in studies conducted with migrant (sub)groups in various countries.

Strengths and limitations

The results of our review must be viewed with caution because of several limitations. Our findings have limited generalisability to the international population of older migrants, as all trials were conducted in high-income countries, primarily the United States and only one study in Europe. This lack of diversity in studies shows that academic research on ageing among older migrants remains scarce. The search of this study yielded several study protocols of future interventions targeting health and/or well-being among older migrants in various countries, this shows that there will be more interventions for this population in the future.

Despite the heterogeneity that exists among and within subgroups of migrant populations (e.g. in terms of country of origin, reason for migration, age at migration, number of years living in the host country), our review focused on migrants in general and included studies conducted with diverse racial/ethnic groups. Thus, we could not draw conclusions about the effectiveness of BCTs for specific migrant groups. Our findings shed light on ageing among migrants, but as older migrants form a heterogeneous group, suggestions about behavioural change interventions

need to be aligned with country and population subgroup contexts. In addition, this study did not report possible costs associated with older migrant health.

The BCTTv1 facilitates the accurate identification of intervention content and provides a useful overview of BCTs and their definitions. However, it does not permit consideration that BCTs might be effective only under the specific conditions in which the interventions are delivered (i.e. the potential for interaction between BCTs and intervention contexts) [233]. In addition, overlap may exist in BCTs delivered in the intervention and control groups [234, 235], which hampers the drawing of conclusions about which BCTs do and do not work. In this study, this factor was taken into account by including only BCTs delivered in the intervention group, and not in the control group, in the analysis, as recommended by Peters and colleagues [191]. Moreover, the implementation of sets of BCTs in interventions might pose a challenge because some BCTs may be employed simultaneously. For example, a previous study showed that interventions combining self-monitoring, goal-setting and action planning were twice as effective as those that did not [122]. These contextual factors might impact the effect size and interact with the intervention content, thereby confounding the BCT–effect size relationship [191, 236]. Despite these limitations, however, the BCTTv1 is a useful tool for the assessment of effectiveness at the BCT level, as demonstrated by analyses conducted in various health behaviour contexts [116, 118, 122]. For example, one study showed that problem-solving, social support, goal-setting, the use of prompts and the provision of feedback on behaviour were associated with greater intervention effects on fruit and vegetable consumption compared with interventions not including these BCTs [117]. To fully understand the effects of BCTs on behaviour, the classification of knowledge about other aspects of BCIs and its inclusion in the analysis of BCT effectiveness are crucial. Michie and colleagues [189] noted the need to develop proper methods to link evidence from various types of evaluation, to permit the drawing of conclusions regarding effect sizes of BCT combinations tailored to the targeted behaviours and contexts.

The BCTTv1 is a valuable tool, as it assisted to relate descriptions of intervention content to definitions of BCTs. Vigorous BCT coding depends on the provision of complete descriptions of interventions in the original studies [189, 237]. In addition, more BCTs than reported may have been implemented in the interventions in practice. We did not contact the authors of the included studies; rather, we addressed this situation by coding BCTs as probably present (+) in addition to definitely present (++) following the coding scheme. BCTs were coded using only published papers and, when available, published protocols, which might have increased the risk of publication bias. Additionally, some BCTs may not have been captured, as interventions are often poorly described [238]. Detailed intervention

description is important not only for BCT coding, but also for intervention delivery. BCT delivery can be challenging; for example, goal setting requires specific behavioural, measurable, observable and challenging, yet realistic, goals [239-241]. Published descriptions of interventions typically provide insufficient details to check for appropriate delivery of this BCT and others.

Our study included articles described health and well-being outcomes in different ways, and not all articles mentioned effect sizes, thereby limiting our ability to conduct a meta-analysis. Although our review revealed differences in terms of health and well-being outcome measures, features beyond ethnic association alone may have contributed to this variance. For instance, contextual factors such as limited proficiency in the native language, social isolation and barriers to health and well-being behaviours might be stronger predictors among migrant (sub)groups. Migrants are extremely diverse in terms of migration patterns, nativity, language and socio-economic status. Thus, interventions that consider how these factors may affect health and well-being behaviours by subgroup are critical. Although linguistic tailoring increases accessibility and acceptability, more adaptions might lower barriers to the performance of healthy behaviour(s).

Future research

In this study we focused on the general older migrant population. Future research could focus on the effectiveness of the BCTs examined in various contexts and subgroups of older migrants. For example, acculturation is related to health behaviours [242-244], but may differ among migrant groups and host countries. Moreover, all interventions examined in this review incorporated combinations of BCTs, which may increase effectiveness [122]. The specific BCT combinations that most effectively promote health and/or well-being among older migrants, however, have not been identified clearly. Future research could focus on examining BCT combinations and the interplay among them, as well as the mechanisms by which effective BCTs modify behaviour, to enable the development of interventions with components that are more likely to be effective [245] and to better explain interventions' effects [246]. In addition, the majority of participants in the studies included in the present review were female (S8 Table). An in-depth understanding of this bias will be important for future research to meet the needs of other gender groups. Finally, the quality of the included studies was judged using various categories and the risk of bias. In future research, several other sources of bias may also need to be considered. For example, detailed descriptions of the interventions (e.g. language use in intervention materials), which may not always be provided in study publications, should be considered as such factors may have impacts on response rates.

CONCLUSIONS

We identified 13 promising BCTs used in interventions to promote health and well-being among older migrants. Older migrants are heterogeneous, with diverse subgroups within and across countries, and have different unhealthy behaviours to address. In addition, future research should examine the effectiveness of these BCTs in various contexts and among different subgroups of older migrants, as well as the mechanisms through which these BCTs act. In addition, given the paucity of interventions in which cultural adaption has been taken into account in alignment with the target group, future BCIs should consider cultural appropriateness for different older migrant (sub)groups. Our findings may guide future research with the goal of developing culturally appropriate interventions incorporating promising BCTs that can change behaviours and improve the health and well-being of older migrants.

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APPENDIX

Table 1. PRIMA 2009 checklist
This table is available online and can be accessed through the following link: https://doi.org/10.1371/journal.pone.0269778.s001

Table 2. Search strategy
This table is available online and can be accessed through the following link:
https://doi.org/10.1371/journal.pone.0269778.s002

Table 3. Assessment of quality for included randomized controlled trials studies based on Cochrane tool
This table is available online and can be accessed through the following link:
https://doi.org/10.1371/journal.pone.0269778.s003

Table 4. Assessment of quality for included non-controlled intervention studies based on Newcastle-Ottawa Scale
This table is available online and can be accessed through the following link:
https://doi.org/10.1371/journal.pone.0269778.s004

Table 5. Study characteristics of included trials
This table is available online and can be accessed through the following link:
https://doi.org/10.1371/journal.pone.0269778.s005

Table 6. Coded BCT per individual intervention
This table is available online and can be accessed through the following link:
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Table 7. Intervention effectiveness involving assessment ≥ 3 months post baseline by outcome clusters
This table is available online and can be accessed through the following link:
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Table 8. Summary of study characteristics
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3 Age-friendly neighbourhoods and physical activity of older Surinamese individuals in Rotterdam, the Netherlands

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ABSTRACT

Background: Age-friendly neighbourhoods seem to promote physical activity among older individuals. Physical activity is especially important for chronically ill individuals. In the Netherlands, older Surinamese individuals are more likely to have chronic diseases than are their native Dutch counterparts. This study examined relationships of neighbourhood characteristics with physical activity among older Surinamese individuals in Rotterdam, the Netherlands.

Methods: Of 2749 potential participants, 697 (25%) community-dwelling older (age ≥ 70 years) Surinamese individuals living in Rotterdam, the Netherlands, completed a questionnaire on personal and neighbourhood characteristics between March and June 2020. Correlation and multilevel regression analyses were performed to identify associations between missing neighbourhood characteristics for ageing in place and physical activity.

Results: Scores for the neighbourhood domains outdoor spaces and buildings (r = -0.084, $p \leq 0.05$), communication and information (r = -0.099, $p \leq 0.05$), community support and health services (r = -0.139, $p \leq 0.001$), and respect and social inclusion (r = -0.141, $p \leq 0.001$), correlated negatively with participants' PA. In the multilevel analysis, overall missing neighbourhood characteristics to age in place scores were associated negatively with physical activity ($p \leq 0.05$).

Conclusion: This study showed the importance of age-friendly neighbourhoods for physical activity among older Surinamese individuals in Rotterdam, the Netherlands. Our findings suggest that the neighbourhood plays an important role in supporting older individuals' leading of physically active lifestyles. Further research is needed to support the development of interventions to create age-friendly neighbourhoods.

INTRODUCTION

The health of older Surinamese individuals in the Netherlands is worse than that of the native Dutch population. These individuals are more likely to have (multiple) chronic diseases (e.g. hypertension, type 2 diabetes mellitus) [1-5] and to experience psychological distress [6] than are native Dutch individuals. Additionally, older Surinamese individuals have a greater risk of death from these chronic diseases than their native counterparts with the same socio-economic backgrounds or educational levels [1-3, 7]. Physical activity (PA) plays a significant role in the prevention of many chronic diseases, including hypertension and type 2 diabetes [8-11]. PA involves all movements including actively commuting (walking, cycling), household activities, and leisure-time activities (sports, walking, gardening, cycling) [12]. Despite current knowledge about the importance of PA, a decline in the average activity level with age [13, 14] and a low PA level among Surinamese individuals in the Netherlands [15] have been observed.

Neighbourhood characteristics provide potential opportunities and barriers to engagement in physically active lifestyles [16]. It becomes more important as people age, likely because older individuals spend more time in their neighbourhoods than do their younger counterparts [17-19]. This makes them more dependent on the social and physical infrastructure of the neighbourhood. Thus, the investigation of associations between neighbourhood characteristics and PA among older individuals is of particular relevance. In addition, declining physical and mental health and increased fragility reduce older individuals' ability to cope with environmental demands [20-22], and these qualities are more prevalent among older Surinamese individuals than among older individuals born in the Netherlands [23, 24].

Rotterdam is the second largest city in the Netherlands, and it hosts 19% of older individuals who migrated from non-Western countries, of which Surinamese individuals form the largest group [25]. On average, Rotterdam has a lower socioeconomic status than the Netherlands in general [26]. Health deprivation and worse perceived health are also more prevalent in this city than in other Dutch cities [27]. Individuals who migrated from non-Western countries are concentrated highly in large cities and often live in deprived neighbourhoods [28, 29], which may entail low levels of greenness [30], poor services provision and a lack of social cohesion [31], in turn impairing physically active lifestyles.

The World Health Organization (WHO) identified eight domains for the description of neighbourhood characteristics in 'age-friendly' cities [32]: 1) outdoor spaces and buildings, 2) housing, 3) transportation, 4) communication and information, 5) community support and health services, 6) respect and social inclusion,

7) social participation, and 8) civic participation and employment. These domains are likely to be associated with the PA levels of older individuals and are discussed individually below [33].

Research aim

Age-friendly neighbourhood characteristics seem to be associated with the PA of older individuals. However, the current literature lacks studies on the effects of neighbourhood characteristics on diverse societal subgroups [34]. As older Surinamese individuals are more likely to develop chronic conditions, compared to native Dutch individuals, that can be prevented by regular PA, the aim of this study was to examine associations of neighbourhood characteristics with PA levels among older Surinamese individuals in Rotterdam, the Netherlands. We hypothesised that physical activity would be associated negatively with missing neighbourhood characteristics among older Surinamese individuals.

Outdoor spaces and buildings

Older individuals have emphasised the importance of walkability (e.g. the presence of walking surfaces, sidewalks, bike lanes) for the performance of PA in their neighbourhoods [35-37]. Neighbourhood infrastructure seems to be important for the improvement and/or maintenance of individuals' PA levels. For example, greater street connectivity [38, 39], (perceived) traffic safety [40, 41], distances to destinations such as parks and stores [39, 42, 43] and access to these destinations [36] have been associated with more walking and bicycling. These factors might be especially important for older individuals due to, for example, mobility limitations resulting in the use of a walker or wheelchair. Terrain features such as steps and uneven surfaces [44] might be barriers for neighbourhood PA. Conversely, traffic lights [45], street lighting [45-48] and facilities such as benches and toilets are important facilitators [46, 49]. For example, the timing of traffic lights at pedestrian crossings must consider the walking speed of crossing users, and research has indicated that older individuals become delayed as the traffic volume increases [50]. Furthermore, attractive and green open spaces lead to more PA [37, 39].

Housing

Indoor aspects also play important roles in the activity levels of older individuals. Suitable housing is an important facilitator of older individuals' PA [51]. For example, wide doors and non-slippery floors enable older individuals, including those who use walkers and wheelchairs, to move about in their homes. Even floors make it easier for older individuals to go outside (e.g. for grocery shopping or a walk) and to be physically active. The availability of home modification programmes might

also be essential for older individuals without limitations. For example, research has indicated that older individuals with home modifications (e.g. railings, bathroom modifications) are less likely to experience declines in physical functioning and falls [52]. In addition, home modification has been shown to improve the activities of daily living of older individuals with and without limitations [53, 54], making them less dependent on others and more likely to be active on their own.

Transportation

Transportation involves movement from place to place, for example, by car, public transportation, walking or cycling. Regardless of cultural and policy differences, the car is the most commonly used mode of transport by older populations worldwide [55-57]. Various health conditions associated with ageing (e.g. visual impairment, dementia, Parkinson's disease) may negatively impact driving performance [58-60]. However, the largest proportion of older drivers is considered to be healthy [61]. Driving-related facilities might facilitate PA among older individuals. For example, the presence of parking lots (e.g. at shopping malls or parks) has been associated positively with walking in this population [62], and thus might increase PA.

Access to public transportation (including stops and vehicle features such as priority seating, low steps and non-slippery floors) might be another significant contributor to PA among older individuals [63, 64]. It seems to be associated with older individuals' walking in their neighbourhoods [35, 65]. Older individuals have emphasised the importance of the proximity of public transportation stops [66], stops at key destinations (e.g. health care and shopping centres) and well-connected routes [32] to their use of public transportation. The availability of information such as clear time tables, routes and signage in public vehicles also seems to be an important factor [32].

Walking and cycling are common forms of neighbourhood transportation. The distance to a given destination seems to be an important contributor to individuals' decision to walk or cycle [67, 68]. Neighbourhoods with greater residential density, mixed land use and grid-like street patterns with short blocks have been shown to enhance the use of walking and cycling for transportation [69]. In addition, perceptions about traffic and busy roads seem to be associated with walking for a particular purpose [36].

Communication and information

Informing older individuals about neighbourhood services and programmes is important to make them aware of these opportunities [70, 71], and might increase their participation, for example, in PA programmes [72]. However, the location

and source of information provision must be considered. For example, older individuals appreciate the availability of information at locations that they frequent; information provision by individuals in close, regular contact with older individuals, such as health care providers, is also essential [73-75]. Older individuals have emphasised the importance of knowing where to look for information [76]. In addition, the format and design of materials (e.g. use of large font and understandable language, sound quality) are important to make information accessible for older individuals [32]; appropriate designs contribute to their healthy behaviours, including PA [77].

Community support and health services

Community and health services provide formal support, such as in general practitioner (GP) practices and pharmacies, and informal support, such as that of neighbours and volunteers. These services are vital to the maintenance of older individuals' health and independence [32], and eventually might have impacts on their PA, which takes place most often in community settings. Neighbours can be important facilitators of PA among older individuals [48], who prefer and respond best to face-to-face social support and peer coaching [78-81]. Such individualised support seems to engage older individuals in PA, as it provides them with advice and information from non-professionals with common backgrounds (e.g. similar life experiences, shared characteristics) who help them to reach shared goals [79, 81, 82]. Thus, the provision of PA sessions that involve face-to-face social support and/or peer coaching in the community might encourage older individuals to be physically active.

Research suggests that GPs can effectively promote PA with simple positive-reinforcement messages and the provision of specific plans for fitness-related activities, known as 'PA prescriptions' [83, 84]. In addition, GPs seem to play an important role in the provision of information (e.g. about community PA programmes and groups) to older and chronically ill individuals, thereby facilitating participation in neighbourhood activities [85].

Respect and social inclusion

The attitudes, behaviour and messages of individuals in the community toward older individuals should convey respect and social inclusion. The degree to which this is true affects the range of opportunities offered to older individuals for social participation, entertainment and/or employment. Greater neighbourhood social cohesion has been shown to facilitate older individuals' participation in community-based activities overall, and specifically to increase their engagement in PA [86-90]. In addition, a sense of belonging has been found to be important for older

individuals' participation in activities [91]. Community belonging is associated with healthy behaviours such as walking [92], and it encourages networking [93]. Finally, (perceived) neighbourhood safety and fear of violence influence individuals' activity levels [40, 94].

Social participation

Participation creates opportunities for older individuals to be physically active and to broaden their networks [95]. Conversely, older individuals with limited social participation are less likely to be physically active [96]. Thus, the creation of opportunities for older individuals to participate socially and to create networks might eventually increase their PA.

Civic participation and employment

Civic participation and employment (paid or unpaid), such as (flexible) job opportunities, job training, volunteer work and involvement in decision-making bodies, provide opportunities for older individuals to exercise citizenship. Older individuals who volunteer might also be more physically active [97]. However, volunteer opportunities need to be accessible and tailored to older individuals' capabilities and interests [32, 98]; visual impairment, for example, has been found to reduce the community participation of older individuals [99]. The promotion of volunteer work, which has been found to be a successful predictor of older individuals' social connectedness [100], might eventually lead to older individuals' engagement in PA.

METHODS

Population

In the Netherlands, Surinamese individuals form one of the largest groups with non-Western migration backgrounds. Surinam is a former Dutch colony that obtained independence in 1975. Surinamese individuals migrated to the Netherlands in two main waves, seeking higher education and work and due to political unrest, respectively [101]. The population of Surinam is heterogeneous in terms of culture and geographic origin, including Javanese, Surinamese Chinese, Surinamese Creole (of West African descent), and Surinamese Hindustani (of Indian descent) groups [102]; the population in the Netherlands is comprised mainly of individuals with the latter two backgrounds. Individuals with comparable Surinamese Creole and Surinamese Hindustani backgrounds can also be found in other European countries, such as United Kingdom. In general, most Surinamese individuals speak

Dutch well, as Dutch is an official language in Surinam and is used in education, government and the media; this characteristic distinguishes this group from other older individuals who migrated to the Netherlands with limited Dutch language proficiency. Community-dwelling Surinamese individuals aged 70 years and older and living in Rotterdam, the Netherlands, participated in this research.

Recruitment and questionnaire administration

Potential participants were identified using Rotterdam's municipal register and asked to participate in this study between March and June 2020. In total 2749 potential participants were contacted, nested in 55 neighbourhoods. Neighbourhoods were classified using four-digit postal codes assigned by the Dutch government. Questionnaires and self-addressed envelopes were distributed via post, followed by a postal reminder. An informational leaflet explaining the aim of the study and its anonymous and voluntary nature was provided to the respondents. Informed consent (written) was obtained from all participants. The first author's contact information was provided in case potential participants had additional questions. No (financial) incentive was provided. The Ethics Review Committee of Erasmus University Rotterdam approved this study (application no. 19-048) and determined that the rules imposed by the Dutch Medical Research Involving Human Subjects Act did not apply.

Of 2749 older Surinamese individuals contacted, 34 were found to be ineligible due to medical conditions (e.g. dementia, rehabilitation), nursing home residence, change of address or death. Thus, the number of eligible participants was 2715. Of them, 697 individuals filled in the questionnaire (25% response rate).

Measures

Missing neighbourhood characteristics to age in place

Neighbourhood characteristics were evaluated using an instrument developed and utilised in previous research [103-105], applying the WHO framework for age-friendly cities (2007) and additional research [32, 106] (Appendix Table 1).

As the questionnaire was developed among the general population of older individuals in the Netherlands [103], we assessed its suitability for the older Surinamese population with four 70-year-old Surinamese individuals in the Netherlands in December 2019–January 2020. As a result, we added two items to the questionnaire; 'A neighbourhood where individuals help me, for example with a chore or to bring me somewhere' (community support and health services) and 'A neighbourhood where social activities are organized specially for Surinamese older individuals' (social participation). Participants were asked to indicate whether they missed

neighbourhood components using a five-point scale ranging from 0 ('not at all') to 4 ('extremely'). Twenty-six items representing the eight age-friendly city domains recognized by the WHO were assessed. Examples by domain are 'Public buildings with elevators that are easily accessible for wheelchairs and walkers' (outdoor spaces and buildings, 4 items), 'Suitable housing for older individuals' (housing, 2 items); 'Good public transport' (transportation, 2 items), 'Local newspaper with information about what's going on in the neighbourhood' (communication and information, 2 items), 'A neighbourhood with the GP and pharmacy at walking distance' (community support and health services, 6 items), 'A neighbourhood where individuals have respect for older individuals' (respect and social inclusion, 5 items), 'Affordable activities for older individuals' (social participation, 3 items) and 'A neighbourhood where older individuals are involved, for example concerning changes in the neighbourhood' (civic participation and employment, 2 items). Mean total and domain scores were calculated; higher scores represented more missed neighbourhood characteristics. The Cronbach's alpha value for the mean total was 0.894, indicating excellent reliability. Cronbach's alpha value for the subscales ranged from 0.531 to 0.869. We also checked if deleting items resulted in a better Cronbach's alpha, which was only the case for one item ('A neighbourhood with people of the same ethnic background as me'). Previous research, however, showed that this item was important for the general older Dutch population [103, 104]. Therefore, we decided to keep this item which allowed us to examine the importance of this item among older Surinamese people.

Physical activity

PA was assessed by asking respondents on how many days per week they were physically active for at least 30 minutes. The questionnaire items covered active commuting (walking, cycling), household activities and leisure-time activities (sports, walking, gardening, cycling). This question is from the validated and reliable short questionnaire to assess health-enhancing physical activity (SQUASH) [107, 108]. Government agencies use this instrument to monitor the PA of the Dutch population [109]. Scores ranged from 0 (not physically active for 30 minutes on any day during the week) to 7 (physically active every day of the week). PA scores were dichotomised as meeting (1; 30 minutes PA per day on at least 5 days of the week) and not meeting (0) the Dutch standard for healthy physical activity [109].

Number of chronic diseases

A questionnaire was used to identify the presence of chronic diseases and inquired the following question: 'Have you had any of the following diseases or conditions in the previous 12 months?' (0 = no, 1 = yes). A list of 10 chronic conditions (i.e. car-

diovascular diseases, diabetes, lung diseases) adopted from O'Halloran et al. [110] was provided. Participants were also asked to report unlisted conditions, which resulted in the reporting of 51 additional conditions, including kidney failure and limited vision. These conditions (denoted 'other chronic diseases') were taken into account when we counted chronic diseases. We allocated participant-reported conditions already listed on the questionnaire to the appropriate listed options. Participants also reported risk factors for chronic diseases, such as high cholesterol and high blood pressure, which we did not include in the analysis. Simple count was used in the analyses.

Socio-demographic variables

The questionnaire solicited information on respondents' age, gender (male or female) and marital status (living alone/widowed/divorced or married/living with a partner). Respondents were asked to report the highest educational level completed in the Netherlands or abroad, with the option to write unlisted forms of schooling. This variable was dichotomised as low (completion of elementary school or less) and high (more than elementary school). Income levels were determined based on respondents' reported monthly household incomes, including social benefits, pensions and alimony. Response options ranged from 'less than €1000 a month' (1) to '€3050 or more a month' (4), with a fifth 'do not know/ do not want to tell' option provided. This variable was dichotomised as low (less than €1350 a month) and high (€1350 or more a month).

Statistical analyses

The SPSS software (version 26; IBM Corporation, Armonk, NY, USA) was used to analyse the data. Descriptive statistics (means, minimums, maximums, standard deviations and/or percentages) were calculated for all variables. Assessment for multicollinearity yielded tolerance values > 0.3 and variance inflation factors < 3, indicating no sign of multicollinearity. Spearman correlation analysis was performed to identify associations of background characteristics and missed neighbourhood characteristics with PA. Two-sided p values ≤ 0.05 were considered to be significant. We found that the neighbourhood level significantly affected PA by comparing the –2 log likelihoods of the regression models containing PA only and containing PA and the neighbourhood level (Appendix Table 2). We thus employed multilevel regression analyses to account for the clustering of our data; older Surinamese individuals (level 1) were nested in 55 neighbourhoods (level 2). Unaggregated individual data were used for all analyses. In the multilevel model, besides a random intercept on neighbourhood level, we evaluated the necessity of adding random slopes for the different covariates (age, sex, marital status, educa-

tion, income, and number of chronic diseases). This evaluation was performed with likelihood ratio tests. Furthermore, because age is the only covariate with a non-meaningful zero, the centred value of age was used in the multilevel modelling. All multilevel analyses were performed with the mixed procedure in STATA (version 17) using maximum likelihood. The regression coefficients in the mixed procedure were tested with the z-test.

RESULTS

Table 1 displays the characteristics of the 697 study participants; 54.2% were women, 67.4% were unpartnered, 38.5% had low educational levels and 49.7% had low incomes. The mean age was 76.2 ± 4.9 (range 70-100) years and the mean number of chronic diseases was 1.6 ± 1.4 (range 0-8). The missing neighbourhood characteristic scores ranged from 0.90 ± 0.90 to 1.4 ± 1.5 (range 0–4), suggesting that the respondents found their neighbourhoods to be moderate to highly age-friendly. On average participants were physically active on 3.7 days per week; 39.8% of the participants met the PA standard.

Table 1. Descriptive Statistics for the Study Population (*n* = 697)

Characteristic	Range	% or mean (SD)
Gender (female)[a]		54.2
Age	70-100	76.2 (4.9)
Marital status (unpartnered)[b]		67.4
Education (low)[c]		38.5
Income (low)[d]		49.7
Number of chronic diseases	0-8	1.6 (1.5)
Missing neighbourhood characteristics to age in place		
Outdoor spaces and buildings	0-4	1.1 (1.0)
Housing	0-4	1.4 (1.3)
Transportation	0-4	1.1 (1.1)
Communication and information	0-4	1.0 (1.0)
Community support and health services	0-4	1.0 (1.0)
Respect and social inclusion	0-4	1.1 (0.9)
Social participation	0-4	1.4 (1.2)
Civic participation and employment	0-4	0.9 (0.9)
Overall missing neighbourhood characteristics to age in place	0-4	1.1 (0.8)
Number of days physically active	0-7	3.7 (2.4)
Meeting physical activity standard		39.8

SD, standard deviation.
[a] = reference category is male, [b] = reference category is partner, [c] = reference category is high education, [d] = reference category is high income

Table 2 displays the results of the correlation analyses. Age ($p \leq 0.01$), unpartnered status ($p \leq 0.01$), low educational level ($p \leq 0.01$), low income ($p \leq 0.001$), and number of chronic diseases ($p \leq 0.001$) were associated negatively with PA. In addition, we found negative correlations of PA with the domains outdoor spaces and buildings, communication and information, community support and health services, respect and social inclusion and overall missing neighbourhood characteristics to age in place scores (r = -0.099 to -0.141, all $p < 0.05$).

Table 2. Correlations of Participant and Missing Neighbourhood Characteristics to Age in Place with Physical Activity (*n* = 697)

Variable	Physical activity		
	n	**r**	***p***
Age (years)	633	-0.123	0.002**
Gender (female)[a]	633	0.038	0.339
Marital status (unpartnered)[b]	618	-0.114	0.005**
Education (low)[c]	617	-0.107	0.008**
Income (low)[d]	596	-0.148	<0.001***
Number of chronic diseases	621	-0.153	<0.001***
Missing neighbourhood characteristics to age in place scores			
Outdoor spaces and buildings	601	-0.084	0.038*
Housing	609	-0.020	0.622
Transportation	612	-0.076	0.060[#]
Communication and information	585	-0.099	0.016*
Community support and health services	588	-0.139	0.001***
Respect and social inclusion	592	-0.141	<0.001***
Social participation	610	-0.003	0.947
Civic participation and employment	586	-0.072	0.082[#]
Overall missing neighbourhood characteristics to age in place[a]	558	-0.114	0.007**

n = sample size, r = correlation coefficient

[a] = reference category is male, [b] = reference category is partner, [c] = reference category is high education, [d] = reference category is high income

[#]$p \leq 0.10$, *$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq 0.001$.

The results of the multilevel analyses are presented in Table 3. Regarding the random slopes, we found that a random slope for education significantly improved the model. Adding random slopes for the other covariates did not significantly improve the model. So, the final multilevel model contained a random intercept and a random slope for education (see Table 2 of the Appendix for the final multilevel model). After controlling for background characteristics age ($p < 0.01$) and unpartnered status ($p = 0.02$) were significantly associated negatively with PA (Table 3). In addition, the overall missing neighbourhood characteristics to age in place score was associated negatively with PA ($p = 0.005$). Unlike the correlation

analysis, the multilevel regression analysis revealed no significant association of PA with low educational level ($p = 0.11$), low income level ($p = 0.56$) or number of chronic diseases level ($p = 0.06$).

Table 3. Associations of Participant and Neighbourhood Characteristics to Age in Place with Physical Activity, as Determined by Multilevel Analysis

Variable	Physical activity		
	B	95% CI	*p**
Constant	4.63	4.17 to 5.08	<0.001
Age (years; centred)	-0.10	-0.14 to -0.06	<0.001
Gender (female)	0.36	0.05 to 0.78	0.09
Marital status (unpartnered)	-0.54	-1.0 to -0.08	0.02
Education (low)	-0.44	-0.99 to 0.11	0.11
Income (low)	-0.13	-0.56 to 0.30	0.56
Number of chronic diseases	-0.38	-0.78 to 0.01	0.06
Overall missing neighbourhood characteristics to age in place	-0.34	-0.58 to -0.10	0.005

B = unstandardized regression coefficient derived from the mixed procedure in STATA, CI = Confidence Interval, *p values based on the z-test.

DISCUSSION

This study demonstrated the importance of neighbourhood characteristics for older Surinamese individuals' PA. On average, participants considered their neighbourhoods to be moderate to highly age-friendly, perhaps because Rotterdam has implemented programmes to develop supportive neighbourhoods for older individuals (e.g. Let's Talk [*Even Buurten*], NEW ROADS) for decades [111, 112].

Although similar findings have been obtained for the general older population [33, 113], this study is the first to show associations between neighbourhood characteristics and PA among older Surinamese individuals, although the effect sizes were small. As human behaviour responds to neighbourhood characteristics, facilitative changes in the environment are likely to support PA and improve subsequent health outcomes. The crucial role of local governments in providing age-friendly neighbourhoods is acknowledged [106, 114]. Our findings have implications for policy makers and service providers aiming to build and maintain age-friendly communities that support older individuals' PA, in turn benefitting health and potentially reducing care costs [115, 116].

In particular, this study showed a weak association between *outdoor spaces and buildings* and PA levels among older Surinamese individuals. In line with previous literature, our research suggests that attention should be given to features such as walkability (e.g. sidewalks, safe crosswalks), infrastructure (e.g. greater

street connectivity, traffic safety) and the provision of attractive and green open spaces [35, 65, 117, 118]. Walkability has been found to promote walking as a form of transportation [119]. Thus, the presence of nearby destinations (e.g. grocery stores) in walkable neighbourhoods might increase PA among older individuals. In addition, public building accessibility seems to be essential for PA. The involvement of various actors (e.g. architects, contractors, customers) in designing public spaces is important to achieve optimal accessibility [120].

The *communication and information* domain was also correlated with PA among older Surinamese individuals. Native and non-native older individuals have emphasised the importance of knowing where to look for information, which is not always easy [76]. Older individuals, for example, often struggle with finding information about neighbourhood activities and social- and health-related matters. Previous research has indicated that health services contexts (e.g. health care sites and health-related events) are essential places at which such information is provided [121]. However, the consideration of channels that reach older migrants, such as local newspapers and the post, is also important [121]. Older migrants prefer to receive information via printed materials or directly from other people [122, 123]. Efforts to promote access to information, including the implementation of effective communication systems that reach migrant older individuals and a focus on accessible (oral and printed) forms of communication, seem to be essential for the promotion of PA [123].

Our findings support that the domain *community support and health services* is associated with PA among older Surinamese individuals. The social element of activities is an important motivator of native and non-native older individuals' participation in PA and maintenance of physically active lifestyles [81, 124-128]. Older individuals have emphasised that making new friends, socialising and encouraging other participants during group activities motivate them to be physically active [125]. The provision of social support in the community setting has been shown to effectively increase PA [129]. The creation of environments that facilitate social interaction and the formation of new friendships, which eventually become sources of social support, may motivate older individuals to engage in PA [130-132]. For example, the sharing of food and drink after a PA session creates an opportunity to socialise in addition to being physically active. Such approaches may be especially important for older migrants, who sometimes lack PA-related social support [132]. Thus, community-based PA promotion may enhance PA levels among older Surinamese individuals.

In line with our findings, previous research has demonstrated the potential of PA promotion via neighbourhood health services [133-138]. PA counselling programmes implemented through primary health care, for example, have been

shown to be feasible and cost-effective strategies for the promotion of PA [133-137]. Thus, health care professionals' guidance, such as the provision of verbal advice about PA or the mailing of pamphlets on exercise, is important to encourage PA among older Surinamese individuals [138].

Next, the domain *respect and social inclusion* was correlated with PA among older Surinamese individuals. The feeling that one is respected and socially included is known to be related to PA among community-dwelling older individuals [139, 140]. Accordingly, persistent disrespectful attitudes and ageism have been recognised as important barriers to the development of effective public healthy-ageing policies [141, 142]. Therefore, the ways in which ageing and older individuals are represented should be considered during the development of health interventions.

These findings are particularly relevant for policy makers, as they aid the targeting of neighbourhood characteristics for the development of supportive environments that encourage PA among older individuals. Neighbourhood interventions that promote PA among older individuals have been shown to yield significant results in improving health [143]. Although the WHO framework for age-friendly cities was developed for the older population, it might also benefit the general population [144]. Other factors (e.g. gender, income level, ethnicity, health status) also must be considered when developing interventions to promote PA, as these factors have been associated with behaviour changes and PA levels [145]. In addition, individuals' capabilities should be considered, as neighbourhood characteristics have stronger effects on the behaviour of individuals than those without functional limitations [146].

We did not find a significant relationship between the domains *social participation* and *civic participation and employment* with PA among Surinamese older individuals. A study conducted with individuals aged ≥ 55 years in Ireland showed that community participation was related to a greater frequency of meeting friends socially with PA [33]. However, research on the relationship between social participation and PA among older migrants remains scarce [147]. For older Surinamese individuals, a supportive environment (as reflected by community support and health services, as well as respect and social inclusion) seems to be more important than actual participation in given social activities for PA engagement. Given the age of our population (70 years and older), civic participation and employment are expected to be less relevant to PA.

Although previous research has indicated that housing has been associated with PA among older individuals, our study did not find an association between *housing* and PA among Surinamese older individuals [148]. Older individuals move mainly to better-quality housing in the same neighbourhood [149, 150], maintaining the advantage of a supportive home without the loss of social connections,

outdoor routines and emotional bonding to a familiar place [151]. Participants in this study may not have been thinking about their possible future housing needs, or whether their neighbourhoods accommodated them (or whether they would have to move farther away to meet those needs). Another explanation might be that from an international perspective, homes in the Netherlands are of high quality [152]. More specifically, Rotterdam provides residents with many opportunities for home modification, such as the installation of grab bars, rails and raised toilet seats, resulting in fewer home hazards and improvement in activities of daily living (e.g. dressing) and instrumental activities of daily living (e.g. preparing meals, housekeeping activities) [153, 154]. Thus, study participants' homes may have already supported their capabilities, explaining the lack of association with PA.

Finally, we found no association between the domain *transportation* and PA. In Rotterdam, older individuals (age ≥ 65 years) are qualified to use public transportation for free. In addition, neighbourhood buses are available for individuals aged ≥ 55 years and those with disabilities. For individuals aged 75 years, the municipality of Rotterdam provides an opportunity to travel by bus after 7 p.m. under supervision. Individuals with disabilities (condition duration ≥ 6 months, no full recovery possible, not able to walk more than 100 meters without a break) are able to request a European parking card, which permits them to park for free in spots reserved for disabled individuals (marked with a wheelchair symbol) at busy destinations, such as shopping malls and health care centres. The card also qualifies holders for a private parking space on their license plates to park near their homes. The existence of these transportation privileges and facilities may explain the lack of association with PA. In neighbourhoods without such facilities for older individuals, findings are likely to differ.

This study has several limitations that should be considered when interpreting our findings. Given that the data collection took place during the onset of the COVID-19 pandemic, a separate analysis was performed to determine whether PA levels differed between participants who filled in the questionnaire before and after COVID-19 measures (Appendix Table 3) proposed by the National Institute for Public Health and the Environment which were taken in the Netherlands. Reported PA levels were low initially and did not decrease after the introduction of the COVID-19 measures. Next, given the heterogeneity of the Surinamese population in the Netherlands, additional analyses were performed to determine whether ethnicity (Javanese, Surinamese Chinese, Surinamese Creole and Surinamese Hindustani) significantly affected PA (Appendix Table 4). No significant difference in PA was found among ethnic groups. Additionally, the cross-sectional design of this study prevented us from determining the causality of relationships. However, our results showed a significant association between neighbourhood

characteristics and PA, which is an essential step that prompts further studies to analyze directionality. A longitudinal study design is needed to investigate the relationship between ageing in place and PA over time. Furthermore, this study was conducted in Rotterdam, the Netherlands; research in other regions is needed to understand differences among municipalities and their effects on older individuals' PA. Although some facilities and privileges (e.g. European parking card) are regulated nationally, neighbourhood characteristics such as community support, respect and social inclusion are expected to show regional differences. Thus, future research should involve comparisons among municipalities and/or countries. Finally, the effect sizes in this study were small, indicating that the relationships between neighbourhood characteristics and PA were weak [155].

CONCLUSION

This study showed that the absence of neighbourhood characteristics for ageing in place is associated negatively with PA among older Surinamese individuals in Rotterdam. The findings represent a first step toward the development of interventions and policies contributing to the age-friendliness of neighbourhoods for these older individuals, including support of PA. A longitudinal follow-up study conducted in a variety of settings is needed to examine potential causal pathways and to identify differences among municipalities and their effects on older individuals' PA over time.

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APPENDIX

Table 1. Instrument to Assess Missing Neighbourhood Characteristics to Age in Place

We would like to know what you are missing in your neighbourhood in order to be able to live there as long as possible. Please choose one of the following answer options: Not at all, Slightly, Quite, Very, Extremely.
Outdoor spaces and buildings
A clean and green neighbourhood. A neighbourhood with wide sidewalks and safe crosswalks. Public buildings with elevators that are easily accessible for wheelchairs and walkers. A safe neighbourhood.
Housing
Affordable housing. Suitable housing for older people.
Transportation
Good public transport. Sufficient parking spots.
Communication and information
Local newspaper with information about what's going on in the neighbourhood. Access to internet and internet courses in the neighbourhood.
Community support and health service
A neighbourhood where people help me, for example with a chore or to bring me somewhere. A neighbourhood where home care is easily accessible. A neighbourhood with the GP and pharmacy at walking distance. A neighbourhood with places where older people can go for advice and support. A neighbourhood with volunteers who provide help when necessary. A neighbourhood with shops and other facilities within walking distance.
Respect and social inclusion
A neighbourhood where people have respect for older people. A neighbourhood where people are willing to help each other whenever necessary. A neighbourhood with people having the same ethnical background as me. A neighbourhood where people dare to speak up to each other. A neighbourhood where people great and talk to each other.
Social participation
A neighbourhood where many social activities are organized. A neighbourhood where social activities are organized specially for Surinamese older people. Affordable activities for older people.
Civic participation and employment
A neighbourhood with possibilities for voluntary work. A neighbourhood where older people are involved, for example concerning changes in the neighbourhood.

Table 2. Multilevel Model on Missing Neighbourhood Characteristics for Ageing in Place and Physical Activity

Level 1:

Level 1:

$$Y_{ij} = \beta 0j + \beta 1_j\, age\_centred_{ij} + \beta 2_j\, gender_{ij} + \beta 3_j\, marital\ status_{ij} + \beta 4_j\, education_{ij} + \beta 5_j\, income_{ij} + \beta 6_j\, number\ of\ chronic\ diseases_{ij} + \beta 7_j\, overall\ missing\ neighbourhood\ characteristics_{ij} + e_{ij}$$

Level 2:

$$\beta 0j = \gamma_{00} + u_{0j}$$

$$\beta 1_j = \gamma_{10}$$

$$\beta 2_j = \gamma_{20}$$

$$\beta 3_j = \gamma_{30}$$

$$\beta 4j = \gamma_{40} + u_{4j}$$

$$\beta 5_j = \gamma_{50}$$

$$\beta 6_j = \gamma_{60}$$

$$\beta 7_j = \gamma_{70}$$

Model	- 2 log likelihood	AIC*
With no covariates and no random intercept	2880	2884
With no covariates and a random intercept	2875	2881
With all covariates and a random intercept	2264	2284
With all covariates, a random intercept and a random slope for education	2255	2271

*Akaike information criterion

Table 3. Physical Activity Before and After Implementation of COVID-19 Measures

	Before COVID-19 measures (*n*=215)	After COVID-19 measures (*n*=376)	*p*
	Mean (SD)	Mean (SD)	
Physical activity	3.66 (2.32)	3.79 (2.37)	0.51

*One way paired t-test was performed in order to compare physical activity among participants who filled in the questionnaire before and after the implementation of COVID-19 measures in the Netherlands. SD, standard deviation.

Table 4. Physical Activity of Creole, Hindustani and Other Surinamese

	Surinamese Creole (*n*=259)	Surinamese Hindustani (*n*=234)	Other (*n*=127)	*p*
	Mean (SD)	Mean (SD)	Mean (SD)	
Physical activity	3.70 (2.24)	3.65 (2.45)	3.87 (2.34)	0.68

* Analysis of Variance (ANOVA) was performed in order to compare physical activity among participants based on their ethnicity. SD, standard deviation.

4 Health behaviours and well-being among older adults with a Surinamese migration background in the Netherlands

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ABSTRACT

Background: This study aims to identify the relationships between health behaviours (healthy diet, physical activity, not smoking and social activity) and well-being among older adults with a Surinamese background.

Methods: Community-dwelling older adults (≥ 70 years) with a Surinamese background living in Rotterdam, the Netherlands, were identified by the municipal register. A survey study was conducted to assess background information, health behaviours (healthy diet, physical activity, not smoking and social activity) and well-being. Multiple regression analyses were performed to assess the relationships of health behaviours with well-being while controlling for background characteristics.

Results: Average age of participants was 76.2 (4.9) years, slightly more than half of them were female (54.2%). Almost half of the participants had a low-income level (49.6%). More than half of the participants met the Dutch guidelines of fruit intake (63.0%) and vegetable intake (62.8%). Less than half of the participants met the guidelines of fish intake (40.9%) and physical activity (39.8%). The majority of the participants were non-smokers (87.9%). Most of the participants had daily contact with family/friends (90.9%) and slightly more than half of the participants visited family/friends often (53.6%). Looking at the health behaviours, a positive relationship was found between eating enough fruit ($\beta = .109$; $p \leq 0.05$) and vegetables ($\beta = .135$; $p \leq 0.01$), physical activity ($\beta = .164$; $p \leq 0.001$) and often visiting family/friends ($\beta = .158$; $p \leq 0.001$) with well-being.

Conclusion: This study suggests that next to traditional health behaviours also social activity is an essential health behaviour for the well-being of older Surinamese adults. Research about health promotion should expand its focus by including social activity as health behaviour.

INTRODUCTION

Surinamese people are one of the largest communities with non-Western migratory backgrounds in the Netherlands. The number of older Surinamese adults (≥ 55 years) in the Netherlands has more than quadrupled between 1990 and 2020 [1]. Surinamese people migrated to the Netherlands from Surinam, a former Dutch colony in South America. Surinam's population is diverse, with Surinamese Chinese, Surinamese Creole, Surinamese Javanese and Surinamese Hindustani, all having different cultures and geographical origins. In the Netherlands, the main subgroups are Surinamese Creole (West African descent) and Surinamese Hindustani (Indian descent).

A recent literature review on health and well-being among older migrants (including Surinamese older adults) in the Netherlands, indicated that research into the well-being of older migrants in the Netherlands is scarce; none of the included studies involved the well-being of Surinamese older adults (only Turkish and Moroccan older adults) [2]. However, studies about aspects related to well-being, such as loneliness, were discussed, indicating that Surinamese older adults are more often lonely due to disadvantaged health, socio-economic status and low social participation compared to their native counterparts.

Maintaining a healthy lifestyle such as regular engagement in physical activity (PA), eating healthy and retaining from smoking is well known to be beneficial to people's well-being [3-5]. Furthermore, findings from earlier studies show that people who engage in fewer health risk behaviours are more likely to be satisfied with their lives [6]. Besides traditional health behaviours such as PA, a healthy diet and not smoking, also older adults' ability to stay socially active and connected to others seems to be critical to sustaining their well-being [7].

In general, in all ages health behaviours are known to differ between migrants and natives [8-10], which may be influenced by certain social and cultural beliefs and/or values [11, 12]. According to previous research, beliefs about food vary widely from country to country, and can be influenced by social customs, religion and shared cultural values [13, 14]. Many people with a migration background continue to eat foods from their country of origin, in addition to foods from the host country [15]. Also, among the Surinamese population in the Netherlands, research shows that traditional Surinamese dishes and vegetables play an important role in the dietary behaviour of Surinamese people, especially among the first generation [16-18]. The cooking and eating practices of Surinamese people are deeply rooted in cultural beliefs and values (e.g. bitter vegetables are good for health) [19]. In addition, Surinamese older adults have indicated that the available options in the Netherlands regarding physical activities are insufficiently adapted

to their cultural habits, such as inexperience with recommended 'Dutch' activities such as cycling and unavailability of programs which they prefer (e.g. dancing to Surinamese music), which discourages them to engage in a physically active lifestyle [20]. Furthermore, in Surinamese culture being curvy is often regarded as a sign of beauty, prosperity and strength in their community; this norm is likely to discourage them from being physically active [20]. Religion and culture play an essential role in shaping smoking behaviours, among Surinamese people social norms discourage women to smoke which does not apply to men [21, 22]. Older adults with a Surinamese background are mainly socially active within their own social network (family and friends). Social activities outside the household (e.g. theatre, going to a restaurant) and social clubs (e.g. sports, music) are less popular within this population [23].

In the Netherlands, people with a Surinamese background are more likely to have (multiple) chronic diseases (e.g. type II diabetes mellitus) [24, 25]. Research indicates that chronic diseases are associated with impaired well-being [26]. Engaging in a healthy lifestyle plays an essential role in the prevention of many chronic diseases, such as type II diabetes mellitus and might eventually have a positive impact on sustaining well-being [27].

While previous research has indicated that a healthy lifestyle is associated with well-being among the general older population, there is still a lack of studies investigating the relationship between a healthy lifestyle and well-being among the Surinamese population in the Netherlands. The present study aims to examine the relationship between health behaviours (healthy diet, physical activity, not smoking, and social activity) and well-being among older adults with a Surinamese migration background in Rotterdam, the Netherlands.

METHODS

Population

Surinam is a former Dutch colony in South America that gained independence in 1975. People from Surinam have migrated to the Netherlands mainly because of the unstable political situation in Surinam and to seek higher education and work [28]. As Dutch is an official language of Surinam and is used in education, government, and the media, most Surinamese people speak it well. The health of older Surinamese adults in the Netherlands is worse than that of the native Dutch older population. Older Surinamese adults are more likely to develop (multiple) chronic diseases (e.g. type II diabetes mellitus) and to experience mental health problems than their native counterparts [24, 25, 29-31]. Additionally, older Suri-

namese adults have a greater risk of mortality from these chronic diseases than their native counterparts with the same socioeconomic backgrounds or education levels [24, 29, 30, 32].

Recruitment and data collection

Community-dwelling older adults (≥ 70 years) with a Surinamese background living in Rotterdam, the Netherlands, were identified by the municipal register. Participants were asked to participate in the study between March 2020 and June 2020. A written questionnaire was sent to participants by post with a self-addressed envelope, followed by a postal reminder. The aim of the study and its anonymous and voluntary nature were explained to participants by an information leaflet. The first authors' contact details were provided to participants in case they had additional questions. In total 2749 participants were approached. Thirty-four participants were excluded, as they resided in nursing homes, due to serious medical issues (e.g. dementia, revalidation), change of address or death. Of the remaining 2715 participants, 679 returned filled-in questionnaires (25% response rate), nested in 56 neighbourhoods.

Measures

Well-being

The short version of the validated social production function instrument for the level of well-being (SPF-ILs) was used to assess well-being [33]. The overall well-being was assessed by measuring levels of social well-being (affection, behavioural confirmation, and status), physical well-being (comfort and stimulation), and overall well-being [33-36]. Examples of questions assessing social well-being are: 'Do people really love you?' (affection), 'Do others appreciate your role in the group?' (behavioural confirmation) and 'Do people think you do better than others?' (status). 'In the past few months, have you felt relaxed?' (comfort) and 'Are your activities challenging to you?' (stimulation) are questions which assessed physical well-being. On a four-point scale, responses ranged from never (1) to always (4). The mean of the five subscales was used to calculate overall well-being. In this study, Cronbach's alpha value for overall well-being was 0.85, indicating high internal consistency.

Dietary behaviour

Diet was assessed by evaluating participants' fish, fruit, and vegetable consumption as an indicator of healthy eating. Guidelines of the Dutch Health Council regarding healthy eating were followed to distinguish between healthy and un-

healthy diets [37]. Questions solicited about food quantity and frequency; we gave Surinamese examples in the questionnaire. We used the threshold value of two times a week *fish* consumption to distinguish healthy from unhealthy diets. Fish consumption was dichotomized into 0 (less than 2 times a week fish consumption) and 1 (≥ 2 times a week fish consumption). Participants were asked about their *fruit* consumption, a threshold value of two pieces of fruit every day of which half (one piece) can be replaced by one glass of fruit juice was considered to be healthy. Fruit consumption was dichotomized into 0 (fewer than two pieces of fruit every day) and 1 (≥ two pieces of fruit every day). Vegetable intake was assessed by asking participants whether they consumed 200 grams of vegetables per day. Vegetable consumption was dichotomized into 0 (fewer than 200 grams of vegetables per day) and 1 (≥ 200 grams of vegetables per day).

Physical activity

Participants were asked to report how many days per week they were physically active (i.e., sports activities, exercise, house cleaning, work in the garden) for at least 30 minutes each day. This question comes from the validated and reliable short questionnaire to assess health-enhancing physical activity (SQUASH) [38, 39]. In the Netherlands, government agencies use this instrument to monitor the PA of the population [40]. Scores ranged from 0 (not being physically active at all for at least 30 minutes a week) to 7 (being physically active for at least 30 minutes every day of the week). The Dutch Standard for Healthy Physical Activity (≥ 5 days per week at least 30 minutes physically active) was used to dichotomize the PA scale into 0 (not meeting the standard) and 1 (meeting the standard of PA and being active for at least 30 minutes a day for at least five times per week) [40].

Smoking

Smoking was assessed by asking participants whether they currently smoked (0 = yes/ 1 = no).

Social activity

Social activity was assessed by asking participants how often they visited family and friends (never, once a year, several times a year, 1 – 3 times a month, once a week, several times a week). This variable was dichotomized into 0 (≤ 1 – 3 times a month visiting family or friends) and 1 (≥ 1 – 3 times a month visiting family or friends). Additionally, participants were asked how many people visited or called them per day (none, 1 – 2, 3 – 4, 5 – 6, 7 – 10 or > 10). This variable was dichotomized into 0 (no daily contact with family or friends) and 1 (daily contact with family or friends).

Multimorbidity

Multimorbidity was defined as having two or more chronic diseases [41]. The presence of chronic diseases was determined using a questionnaire that asked, 'Have you had any of the following diseases or conditions in the preceding 12 months?' (0 = no, 1 = yes). A list of 10 chronic conditions (i.e. cardiovascular diseases, diabetes, lung diseases) developed by O'Halloran et al. [42] was provided. An option to report unlisted conditions was provided to participants, which resulted in a list of 51 additional conditions (e.g. limited vision and kidney failure). Most participants had osteoarthritis (n = 288) or diabetes (n = 249). These conditions were taken into account when we counted chronic diseases. Simple count was used in the analyses.

Socio-demographic variables

The questionnaire additionally asked participants for information on their age, gender (male or female), marital status (living alone/widowed/divorced or married/living with a partner), education and income.

Participants were asked to report their highest educational level completed in the Netherlands or abroad, with the option to write another response for unlisted forms of schooling. This variable was dichotomized into low education (completion of elementary school or less) and high education (more than elementary school).

Participants' monthly household income, including social benefits, pensions and alimony was asked to determine their income level. Response options ranged from 1 (less than €1000 a month net) to 4 (€3050 or more a month net). An option was given with 'Do not know/ do not want to tell' as the fifth category. This variable was dichotomized into low income (less than €1350 a month net) and high income (€1350 or more a month net).

Data analysis

In this study, SPSS software version 27 (IBM Corporation, Armonk, NY, USA) was used to analyse the data. Descriptive statistics were calculated to characterize participants' health behaviours. Bivariate associations of variables expressing background characteristics, health behaviours (diet, PA, smoking and social activity) and well-being were examined. The assessment of multicollinearity yielded tolerance values > 0.3 and variance inflation factors < 3, indicating no sign of multicollinearity. The data met the assumptions of independent errors (Durbin-Watson value = 1.904) and normality of distribution. A histogram and a normal P-P plot of the standardized residuals indicated that the data contained approximately normally distributed errors. Multiple regression analyses were performed to assess the relationships of health behaviours with well-being while controlling for background characteristics. We tested whether neighbourhood level (level 2)

significantly affected well-being by comparing -2 log likelihoods of the regression models containing well-being only and containing well-being and the neighbourhood level. The results showed that the neighbourhood level did not significantly affect well-being (889.613 vs. 886.624; $p = 0.08$). Listwise deletion of missing cases was used in the multivariate analyses ($n = 413$). Results were considered statistically significant when two-sided p values were ≤ 0.05.

RESULTS

Table 1 displays descriptive statistics for the older Surinamese adults. The average age of the 697 participants was 76.2 ± 4.9 (range 70 – 100) years and 54.2% of them were female. The majority of the participants reported being unpartnered (67.4%). Almost 40% of the participants reported low education and almost half of the participants reported having a low income. The mean number of multimorbidity was 1.6 ± 1.4 (range 0-8). Regarding a healthy diet, 40.9% of the participants met the standard of fish consumption. More than half of the participants met the standard of fruit (63.0%) and vegetable (62.8%) consumption. Nearly 40% of the participants met the standard of PA. The majority of the participants reported being non-smokers (87.9%). The majority of participants indicated having daily contact with family/friends (90.9%). Slightly more than half of the participants reported that they did visit their family/friends often (53.6%). Mean scores for overall well-being were 2.86 ± 1.39 (range 1 – 4).

Table 2 shows the correlation between health behaviours (diet, PA, smoking and social activity) and well-being. Significant positive correlations were found between fruit consumption ($r = .153$; $p \leq 0.001$), vegetable consumption ($r = .244$; $p \leq 0.001$) and meeting the PA standard ($r = .210$; $p \leq 0.001$) with well-being. Regarding social activity, a significant positive association was found between daily contact with family/friends ($r = .088$; $p \leq 0.05$) and often visiting family/friends ($r = .225$; $p \leq 0.001$) with well-being. No significant associations were found between fish consumption, smoking and well-being.

Table 3 demonstrates the association of health behaviours and well-being assessed by multiple regression analyses. After controlling for age, sex, marital status, education, income and multimorbidity, fruit consumption ($\beta = .109$; $p \leq 0.05$) and vegetable consumption ($\beta = .135$; $p \leq 0.01$) were associated with well-being among older Surinamese adults. In addition, meeting the PA standard was associated with well-being ($\beta = .164$; $p \leq 0.001$). Finally, often visiting family/friends was associated with well-being ($\beta = .158$; $p \leq 0.001$) among older Surinamese adults.

Table 1. Descriptive statistics of the study population (*n* = 697)

Characteristic	*n*	Range	% or mean (SD)
Age	697	70 – 100	76.2 (4.9)
Gender (female)	697		54.2
Marital status (unpartnered)	680		67.4
Education (low)[a]	676		38.5
Income (low)[b]	654		49.6
Multimorbidity	681		1.6 (1.4)
Diet			
- Fish (meets standard)	685		40.9
- Fruit (meets standard)	605		63.0
- Vegetable (meets standard)	689		62.8
Standard physical activity (meets standard)	633		39.8
Smoking (no)	684		87.9
Social activity			
- Daily contact family/friends (yes)	662		90.9
- Visiting family/friends (often)	658		53.6
Well-being	669	1 – 4	2.86 (0.47)

[a] = low education is completion of elementary school or less, [b] = low income is less than €1350 a month net, SD = standard deviation.

Table 2. Spearman correlations health behaviours (diet, physical activity, smoking and social activity) and well-being among older Surinamese adults

	Overall Well-being		
	r	*p*	95% CI
Age	-.077	.045	-.155 to .001
Gender (female)[a]	-.003	.929	-.081 to .075
Marital status (unpartnered)[b]	-.045	.252	-.123 to .034
Education (low)[c]	-.185	<.001	-.260 to -.107
Income (low)[d]	-.120	.002	-.199 to -.040
Multimorbidity	-.187	<.001	-.262 to -.110
Diet			
- Fish (meets standard)[e]	.003	.940	-.075 to .081
- Fruit (meets standard)[f]	.153	<.001	.070 to .233
- Vegetables (meets standard)[g]	.244	<.001	.163 to .321
Standard physical activity (meets standard)[h]	.210	<.001	.131 to .286
Smoking (no)[i]	.004	.928	-.075 to .082
Social activity			
- Daily contact family/friends (yes)[j]	.088	.027	.008 to .166
- Visiting family/friends (often)[k]	.225	<.001	.148 to .300

r = correlation coefficient, CI = Confidence Interval, [a] = reference category is male, [b] = reference category is partner, [c] = reference category is high education, [d] = reference category is high income, [e] = reference category is meets fish consumption standard, [f] = reference category is meets fruit consumption standard, [g] = reference category is meets vegetable consumption standard, [h] = reference category is meets physical activity standard, [i] = reference category is smoking, [j] = reference category is no daily contact with family/friends, and [k] = reference category is seldom visits for family/friends.

Table 3. Relationships between health behaviours (diet, physical activity, smoking and social activity) and well-being, while controlling for socio-demographic characteristics, among older Surinamese adults

	Overall well-being		
	B	**95% CI**	***p***
Constant	2.774	2.112 to 3.435	.000
Age	-.001	-.009 to .008	.862
Gender (female)	-.047	-.135 to .041	.296
Marital status (unpartnered)	-.040	-.135 to .054	.401
Education (low)	-.122	-.207 to -.038	.005
Income (low)	.004	-.084 to .092	.925
Multimorbidity	-.111	-.192 to -.030	.008
Diet			
- Fish (meets standard)	-.021	-.102 to .061	.616
- Fruit (meets standard)	.109	.020 to .197	.017
- Vegetables (meets standard)	.135	.047 to .222	.003
Standard physical activity (meets standard)	.164	.081 to .248	.000
Smoking (no)	-.052	-.179 to .075	.423
Social activity			
- Daily contact family/friends (yes)	.065	-.088 to .219	.402
- Visiting family/friends (often)	.158	.077 to .239	.000

B = unstandardized regression coefficient, CI = Confidence Interval

DISCUSSION

This study aimed to investigate the relationship between health behaviours (diet, PA, smoking, and social activity) and well-being among older Surinamese adults in Rotterdam. the Netherlands. After controlling for background characteristics and multimorbidity, fruit and vegetable consumption, meeting the PA standard and social activity, specifically visiting family/friends, were associated with better well-being. Although similar findings have been obtained among other population groups [3-5, 7], this study is the first to show associations between multiple health behaviours and well-being among older Surinamese adults.

This study shows that *fruit and vegetable* consumption among older Surinamese adults is associated with better well-being. Several mechanisms may underlie the relationship between fruit and vegetable intake and well-being. For example, fruits and vegetables are rich in micronutrients such as vitamin C, which act as cofactors for neurotransmitters involved in positive motivational states [43].

A few studies have investigated diet among the Surinamese population in the Netherlands, however, these studies have examined the relationship of diet with health related outcomes such as diabetes type II rather than well-being related outcomes [44]. Dietary interventions seem to have the potential to improve the

diet quality of older adults [45]. In the Netherlands, dietary interventions for older adults are mainly focused on malnutrition and its health consequences such as decrease in muscle mass and a decrease in the immune system [46]. Well-being measures are often omitted, despite that well-being improvements are promising to decrease health care utilization and expenditures [47]. In addition, these diet interventions are focused on the general older population, despite research suggests that culturally adapted interventions (e.g. use of traditional vegetables and species) might be more effective in promoting a healthy diet [48]. Future dietary intervention should also focus on outcome measures related to well-being and involve the culture of the targeted population. This will help to develop effective dietary interventions, which will be beneficial for the health and well-being of older Surinamese adults (and the general (older) population) and potentially reduce health care expenditures.

A positive relationship between meeting *PA* guidelines with better well-being was seen in our study. PA releases endorphins in the body, which increase mood and energy, promoting well-being [49]. In the Netherlands, PA interventions are mainly focused to prevent and maintain diseases and limitations [50]; well-being outcome measures are also omitted during evaluation of PA interventions. Less than half of the participants in our study met the PA guidelines of ≥ 5 days per week at least 30 minutes physically active. A recent study among older Surinamese adults showed that neighbourhood characteristics have an important role in supporting older Surinamese adults in engaging in an active lifestyle [51]. Thus, policy makers should promote neighbourhood interventions that promote/support PA among the older Surinamese population, which might also be beneficial for the general population.

In our study, *visiting family/friends* was associated with significantly better well-being. Having *daily contact with family/friends* was not significantly associated with well-being in the multiple regression analyses. This indicates that digital social interactions do not replace face-to-face interactions. Therefore, it can be assumed that face-to-face social contact is more valuable compared to digital social interactions for the well-being of older Surinamese adults. In times of the COVID-19 pandemic, digital solutions were often used to maintain social contact with older adults due to social distancing. While digital solutions might be beneficial to maintain social distancing, this study shows that it is at the expense of the well-being of older Surinamese adults. A relevant example is the relaxation of the COVID-19 measures by the Dutch government at the insistence of the ANBO (*Algemene Nederlandse Bond voor Ouderen*; General Dutch Association for Older Adults), since older adults became socially isolated [52]. Community-dwelling older adults were allowed to see one or two permanent persons physically, as long as the COVID

measures were maintained. Policy makers and future well-being interventions should consider the importance of face-to-face contact upon policy and intervention development. Visiting family and friends may be a way for older adults to receive social support, which may promote well-being through enhanced self-esteem [53]. This increased self-esteem, in turn, may promote optimism, positive affect, and better well-being [54]. Additionally, family members and friends may affect health-related behaviour [55]; social interaction and integration encourage the exchange of health information and persuasion and support, which may influence people, for example, to modify dietary and physical activity patterns [56].

Although Schiepers et al. [57], have indicated a positive relationship between greater *fish consumption* and well-being among a generally healthy population in the Netherlands, our study does not show this relationship. A possible explanation for this might be that our study was conducted among the older population. Indeed, an earlier study conducted among older men also showed no positive association between fish consumption and well-being [58].

In the present study, we found no relationship between *not smoking* and well-being. which is contrary to the findings of Lang et al. [59] who found a positive relationship. Daily exposure to stressors plays an essential role in smoking initiation and continuation [60]. People often attempt to ameliorate stress by smoking which gives them temporary relief [61]. It might be that participants used smoking as a coping strategy for stress. Another possible explanation for this might be the low number of participants who smoked.

The Dutch government supports municipal health promotion, which focuses on changing people's behaviour to promote health and/or prevent disease [62]. For older adults, the focus is on 'healthy and vital ageing.' Municipalities are given tools to help them stimulate healthy behaviour and influence circumstances to improve residents' health, such as materials for interventions recognized to be effective and active intervention elements. The government recognizes the importance of adapting parts of existing interventions to neighbourhood situations and target populations.

Strength and limitations

Our study had several strengths. First, previous research has mainly focused on traditional health behaviours (diet, PA and smoking) and the well-being of older adults. In our study, we also included social activity as a health behaviour. which seems to be essential for the well-being of older Surinamese adults. Second, in the current study specific food items such as Surinamese vegetables (e.g. bitawiri, bravoe) were given as examples, to take the diet habits of Surinamese people into account. Third, despite the diversity in the Surinamese population in the Nether-

lands, we included all ethnic groups in our study. Given the heterogeneity of the Surinamese population in the Netherlands, additional analyses were performed to examine whether ethnicity (Surinamese Chinese, Surinamese Creole, Surinamese Javanese, and Surinamese Hindustani) significantly affected well-being. No significant differences in well-being were found among the ethnic groups (Additional file 1). Fourth, we collected data during the onset of the COVID-19 pandemic, which gives us valuable information about the health behaviours of a vulnerable group in the Netherlands. In order to examine whether well-being levels differed between participants who filled in the questionnaire before and after COVID-19 measures, a separate analysis was performed. Reported well-being levels did not decrease after the implementation of the COVID-19 measurements (Additional file 2).

Our findings should be viewed in light of the study's limitations. First, the study is a cross-sectional survey, which does not permit to make causal inferences. Health behaviours and well-being might be reciprocally related. For example, research indicates that older adults with a higher well-being level tend to have a healthier diet, compared to older adults with a lower well-being level [63]. Future studies should explore the effects of changes in well-being on health behaviours. Second, health risk behaviours such as not meeting the PA goal and irregular eating patterns tend to cluster together in ethnic minority groups but not in native Dutch people [64]. However, in our study, we did not examine this. Future research could investigate these clusters, including social activity. among the Surinamese older population to develop prevention strategies. Third, our response rate was relatively low, which might indicate response bias. We conducted non-response analyses, which revealed significant differences in age and gender between responders and non-responders. There were more females among non-respondents than respondents (60.3% vs. 53.8%), but the effect size was small (phi = –0.058, p = 0.003). Respondents were slightly younger than non-respondents (mean age, 76.23 [SD = 4.93] vs. 76.80 [SD = 5.46] years, respectively; Cohen's d = 0.106, $p < 0.001$). This difference might indicate selective non-response, but we expected a low response rate as the involvement of older non-Western migrants, such as older Surinamese adults, in research is known to be challenging [65, 66]. Moreover, some older adults may not have been able to complete the questionnaire because they were too vulnerable (e.g. health), which may have resulted in the overestimation of the well-being level in the total population. However, this possibility did not influence our main conclusions, as we focused on the relationships between health behaviours and well-being. Fourth, the use of self-administered questionnaires alone to measure PA is a limitation of this study. We collected the study data during the COVID-19 pandemic, which made home visits problematic or impossible. Thus, we did not use objective measures of physical activity such as walking or fitness

tests. Fifth, we did not include items covering all potentially relevant aspects in the questionnaire. For example, we did not ask participants about their oral health, which is known to affect dietary behaviour and to be essential for good health and well-being [67-70]. We also did not assess participants' acculturation, length of residence in the Netherlands, age at migration, cognition, or independence in (instrumental) activities of daily living, which may be associated with well-being or health [71-76]. Future research on health behaviours and well-being should involve the consideration of these aspects.

CONCLUSION

From this study, we can conclude that multiple health behaviours are associated with better well-being among the older Surinamese population. Next to traditional health behaviours (healthy diet and physical activity), social activity (being able to visit others on a regular basis) is associated with the well-being of older adults with a Surinamese background. Since, social participation is still an undervalued health behaviour, intervention designers should involve this. These findings represent a first step toward developing health behaviour interventions and policies to improve the well-being of older Surinamese adults. Policy makers designing health promotion strategies should aim to enhance healthy dietary habits and physical and social activity among older Surinamese adults in the Netherlands to promote their well-being.

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5 Are neighbourhoods age-friendly? Experiences of older Surinamese adults in the Netherlands during the COVID-19 pandemic

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ABSTRACT

Older Surinamese adults in the Netherlands have been disproportionately affected by COVID-19. The ability to provide support in response to older adults' needs contributes to the age-friendliness of neighbourhoods and may be especially important during public health emergencies such as a pandemic. In this study, older Surinamese adults' experience of neighbourhood age-friendliness, as indicator of a vital city, in general and during the COVID-19 pandemic was explored. Based on the eight age-friendly domains identified by the WHO, semi-structured interviews were conducted with 17 Surinamese adults (≥70 years) living in Rotterdam and the Hague. Views on the age-friendliness of the neighbourhoods in general and during the pandemic were asked. Despite differences in resilience within and across neighbourhoods, this study showed that certain age-friendly features can support older Surinamese adults in the Netherlands during a pandemic. These findings have implications for policymakers and health service providers seeking to develop age-friendly neighbourhoods, as an indicator of a vital city, in general and during a pandemic.

INTRODUCTION

In response to the COVID-19 pandemic, countries worldwide adopted policies aiming to reduce viral transmission, which resulted in stay-at-home and physical (or 'social') distancing ('lockdown') measures. Under these conditions, people became more dependent on their neighbourhoods. As such, neighbourhood age-friendliness is expected to play an essential role in the ability to respond to the needs of older people, especially those who are vulnerable or at risk and especially under conditions such as the COVID-19 pandemic [1, 2].

Research indicates that older people with a migration background and ethnic minorities are at greater risk of infection of COVID-19, intensive care unit admission and mortality due to the disease, compared to natives [3-6]. Similarly, in the Netherlands, the relative risks of COVID-19 infection and mortality are greater among people with migration backgrounds than among native Dutch people, particularly in Amsterdam, the Hague and Rotterdam [7]. These risks appear to be greater among people with Surinamese backgrounds compared to people with other migration backgrounds [7]. These findings suggest that older Surinamese adults may have been extra disadvantaged during the COVID-19 pandemic. Furthermore, municipal and societal responses are known to disproportionately affect certain social groups, such as people living in deprived areas [8-10]. People with migration backgrounds are more likely to live in these deprived neighbourhoods [11, 12]. Reduced accessibility of essential physical and social infrastructures during a pandemic raises fundamental questions about the responses required to assist older adults. Additionally, citizens of low-income neighbourhoods are disproportionately affected by COVID-19, as these neighbourhoods have already been impacted by cuts to public services, poor housing quality, a lack of social infrastructure and pressures on the voluntary sector [13].

As described in the introductory article of this special issue, vital cities are better able to absorb shocks (e.g. pandemic effects), recover and positively transform from these shocks than are less vital cities. As parts of vital cities, age-friendly neighbourhoods are expected to offer supportive and adaptive living environments that enable older residents to age within them and optimise their well-being [14, 15]. In (age-friendly) neighbourhoods, communities can develop in which older adults realise well-being needs together [16, 17]. The COVID-19 pandemic has dramatically altered older adults' living environments, restricting access to usual healthcare, daily activities (e.g. grocery shopping) and social support systems (i.e. family and friends). It has provided an example of pandemic challenges to age-friendly neighbourhoods, for example via poor regulations and reduced community participation for older adults [18]. Resilience has been characterised as a

dynamic process of maintaining positive adaptation and effective coping strategies in the face of difficulties [19]. Age-friendly neighbourhoods have been shown to support older adults in times of shock and crisis, due, for example, to existing partnerships, prior efforts to improve communication with older adults and the presence of volunteer networks [18, 20]. Thus, we suggest that the experience of one's neighbourhood as age-friendly can contribute to resilience. In this paper, we use the age-friendly neighbourhood features described by the WHO as indicators of vital cities [15].

The current literature recognises the importance of age-friendly neighbourhood features [21], especially in times of crisis such as a pandemic. However, the extent of this importance for older adults with migration backgrounds remains unclear. Given that older adults with Surinamese backgrounds have been disproportionally affected by the COVID-19 pandemic relative to other population groups in the Netherlands insights are needed for future policy to ensure that it fits the needs of older Surinamese adults. Therefore, the aim of this study was to explore how older Surinamese adults experienced their neighbourhood age-friendliness (as indicators of vital cities) in general and during the COVID-19 pandemic.

THEORETICAL FRAMEWORK

In 2007 the WHO developed the 'age-friendly cities guide' in which they identified eight domains to describe the age-friendliness of a neighbourhood in which communities can improve their structures and services to meet the needs of older adults and include: 1) community support and health services, 2) social participation, 3) respect and social inclusion, 4) housing, 5) outdoor spaces and buildings, 6) transportation, 7) communication and information, and 8) civic participation [15].

Research indicates that age-friendly neighbourhoods have positive impacts on older adults' health and well-being [22, 23]. However, why some neighbourhoods are more age-friendly than others and how age-friendly neighbourhoods are related to the well-being of older adults, especially those with migration backgrounds, remain unclear. In addition, how older adults with migration backgrounds in the Netherlands perceive neighbourhood age-friendliness and whether and how age-friendly neighbourhoods help them realise well-being remains unclear [17].

Consistent achievement of the eight age-friendly domains has proven to be challenging, due to variations in national income levels and urban–rural gradients [24, 25]. Rugel et al. [26] recently demonstrated that older adults residing in low- and middle-income countries and rural areas have less access to age-friendly

facilities and policies in their neighbourhoods than do those residing in higher-income countries and urban areas. Numerous organisations have defined indicators for the monitoring of improvements in neighbourhood age-friendliness, but research has confirmed that these indicators need to be adapted according to what is most relevant in the local context [27]. For example, the presence of a general practitioner may not be a realistic indicator of neighbourhood age-friendliness in all countries.

Community support and health services

The importance of community support and health services increases with illness and disability in advancing age [28]. For older adults, local contacts may be essential resources for social and instrumental support due to mobility and health limitations [29]. During the COVID-19 pandemic, older adults in the Netherlands received support, for example, via neighbours' delivery of groceries and medical prescriptions [30, 31]. In addition, volunteer activities have been implemented to combat social isolation, mental health problems and domestic abuse [32, 33].

Home and community services and support contribute to physical and mental health and well-being [34]. However, barriers such as the lack of service awareness [35, 36] and affordability [35, 37] may impede their utilisation. As many older adults have declining mobility, these services need to be accessible and nearby (e.g. at walking distance) [38, 39]. During the COVID-19 pandemic, digital solutions for the delivery of care to older adults (e.g. online video chatting) were implemented in the Netherlands, but many older adults, lack access to digital services and thus had less access to healthcare [40, 41].

Social participation

Attendance at entertaining activities creates opportunities for older adults to get together and chat with each other, which promotes their community participation and enables them to maintain or establish supportive and caring relationships, thereby enhancing their health and well-being [42, 43]. The benefits of social interaction in neighbourhoods are probably more essential for older than for younger adults, due to the shrinking of social networks in later life [44-46]. In addition, research showed that older adults indicated a decrease in their social life and less in-person social interaction during the COVID-19 pandemic, which was associated with reduced well-being levels [47]. Social distancing due to the COVID-19 pandemic, has brought social challenges with it, which might have an impact on the vitality of a community within a neighbourhood.

Respect and social inclusion

Respect and social inclusion are essential predictors of overall health and well-being of older adults [48, 49]. Social inclusion gives older adults a sense of purpose and belonging to the community. It enables older adults to stay active within the community and fosters ties that prevent isolation. Older adults' development of neighbourhood social networks helps to reduce their loneliness [50]. These favourable social constructs can support the development of health and well-being [51-53]. Greater social inclusion, social capital and social diversity have been associated with better health [51]. In order to stay connected with the community, digital platforms such as Zoom, Facetime and Skype were also used for this purpose during the COVID-19 pandemic [54]. However, older adults indicated that they feel excluded from society due to these digital solutions [55], as it is difficult for older adults in the Netherlands to adapt to new technology [56].

Housing

Housing conditions are linked to older adults' well-being and ability to live independently [57, 58]. Convenient housing design and proximity to neighbourhood amenities support older adults' ageing in place and enables them to cope with (future) challenges which contributes to an age-friendly neighbourhood. The affordability of housing influences where older adults live. High costs can discourage older adults from moving to more suitable housing. The availability of home modification programmes, which can help older adults adjust their homes to meet their needs, is an important factor.

Outdoor spaces and buildings

The external environment significantly affects older adults' mobility, independence and well-being as they age [59, 60]. A clean neighbourhood with well-kept leisure areas, adequate rest areas and well-maintained pavements enables older adults to age in place. Public spaces and parks provide opportunities to exercise (e.g. walk) and interact socially, which are beneficial for physical and mental health [61-63]. In addition, and increased presence of local amenities and neighbourhood proximity to the city centre are strongly associated with the vitality of a neighbourhood [64].

Transportation

Access to convenient transportation options is important for older adults' independence and community engagement, and has been associated with greater well-being [65-68]. Public transport should be accessible for people with a range

of mobility needs. Helpful drivers might aid older adults' use of public transport. The availability of parking facilities for older adults should also be kept in mind.

Communication and information

Adequate information provision enables older adults to stay connected with the community and be informed about neighbourhood events and activities that might promote health and well-being [69-72]. Such information should be made accessible to older adults, for example, by using a suitable font and text size. In addition, language use should be suitable for older adults with low literacy and older migrants who might not have mastered the native language. In the Netherlands, older adults have received information mainly through national television and local newspapers during the COVID-19 pandemic. Digital platforms have been used to communicate and stay informed, but older adults generally have limited access to internet services, rendering information accessibility for them challenging [73]. The challenge may be even greater for older adults with vision or hearing impairments and those who have not mastered the native language. Research indicated that during the COVID-19 pandemic, older adults had less access to high quality information [74].

Civic participation

Engagement in civic activities helps older adults maintain social contacts and continue to be involved in neighbourhood events and politics [75, 76]. For example, available, accessible volunteer work can help to keep older adults socially engaged. To encourage their participation, older adults' preferences, needs, abilities and skills should be considered in the design and offer of volunteer work. In addition, the involvement of older adults in decisions on issues that might impact them is essential. Although civic engagement encompasses diverse activities (e.g. voting, attending community meetings, involvement in public affairs), most research on such engagement among older adults has focused on volunteering [77].

These eight age-friendly neighbourhood domains overlap and interact with each other. For example, *housing* has an impact on older adults' need for *community support services*. *Respect and social inclusion* are reflected in the accessibility of *outdoor spaces and buildings* and the variety of opportunities for older adults to participate in social activities. The provision of accessible public *transport* is an essential feature that enables older adults to participate in family and community life [78, 79]. Conversely, *social participation* has impacts on *social inclusion* and access to information. Furthermore, walkability and the existence of nearby public transport stops may enable older adults' mobility and reduce their isola-

tion. Ultimately, these features may have health benefits and increase older adults' well-being through social inclusion and participation [79].

METHODS

Study population

Surinamese people form one of the largest groups with non-Western migration backgrounds in the Netherlands. Surinam has a colonial history with the Netherlands and obtained independence in 1975. Surinamese people migrated to the Netherlands seeking higher education and work and due to political unrest in their home country [80]. The population of Surinam is diverse in terms of culture and geographic origin, and includes, Surinamese Chinese, Surinamese Javanese, Surinamese Creole (of West African descent), and Surinamese Hindustani (of Indian descent) [81], with most Surinamese migrants in the Netherlands having the latter two backgrounds. Other European countries, such as the United Kingdom, also have citizens with Surinamese Creole and Surinamese Hindustani backgrounds. As Dutch is an official language in Surinam and is used in education, government and the media, most Surinamese people speak Dutch well, which distinguishes them from other people who have migrated to the Netherlands (e.g. those with Turkish and Moroccan backgrounds).

Study setting

This study was conducted (between October 2020 and January 2021) in the municipalities of Rotterdam and the Hague, Province of South Holland, the Netherlands. In January 2020, the population of Rotterdam was slightly more than 650,000 inhabitants, including 100,312 inhabitants aged ≥ 65 years, of whom 6,107 inhabitants had Surinamese backgrounds [82]; the population of the Hague was nearly 550,000 inhabitants, including 79,890 inhabitants aged ≥ 65 years [83], of whom 5,839 inhabitants had Surinamese backgrounds. The Hague is a member of the WHO's age-friendly cities consortium [84], and Rotterdam implements strategies to develop an age-friendly city without being a consortium member.

COVID-19 measures implemented in the Netherlands

In response to the COVID-19 pandemic, the first measures in the Netherlands were taken in mid-March 2020. Basic rules were established to prevent the spread of the virus. Additional rules were in force during the data collection period, based on infection rates and the pressure on the nation's healthcare system (Box 1). The enforcement of these additional rules was relaxed when infection rates decreased.

Box 1. COVID-19 measures implemented in the Netherlands during the data collection period

Basic rules	
	- Keep 1.5-meter distance from others - Avoid crowded places - Work at home unless there is no other option - Cough and sneeze into your elbow - Wear mouth mask in public places.
Additional rules	
October 2020	
	- Maximum of 3 visitors per day at home - Shops closed at 8 p.m. at the latest; shops selling food/basic necessities are excluded - Selling alcohol after 8 p.m. was prohibited - Special shopping hours for vulnerable people - Registration of contact information was needed for clients of contact professions (e.g. hairdresser, beauty salons) - Bars, cafés, restaurants (only take out was allowed) were closed - Events were prohibited
November 2020	
	- Maximum of 2 visitors per day at home - Publicly accessible locations were closed (e.g. museums, cinemas, libraries)
December 2020	
	- Only essential shops were allowed to stay open (e.g. supermarkets, drugstores, gas stations) - Non-medical contact professions (e.g. hairdresser, beauty salons) were not allowed to perform their profession - Gyms were closed

Recruitment

Multiple recruitment strategies were used to reach potential study participants, including community canvassing, the following of community gatekeepers' recommendations, social media, and snowball sampling from an initial set of participants. Community gatekeepers facilitated contact with potential participants, after which the first author (WJ; MSc in Vitality and Ageing, female, PhD candidate) visited these older adults to explain the goal of the research and what they could expect during the interview. Sheets with information about the purpose of the study, what participants can expect during the interview and the first author's contact details were provided to these potential participants. Eligibility criteria were: (a) current residence in the Netherlands, (b) age ≥ 70 years, (c) Surinamese migration background, (d) ability and willingness to answer questions in Dutch and (e) community-dwelling (independently living). In total 17 older Surinamese adults living in Rotterdam or the Hague met the eligibility criteria and agreed to participate in the study.

Data collection

The first author (WJ) conducted semi-structured interviews designed according to the WHO's eight age-friendly domains to obtain insight into participants' perceptions and experiences regarding neighbourhood features in general and during the COVID-19 pandemic (e.g. 'In which (social) activities in your neighbourhood do you participate?' and 'How did you maintain your social contacts during the pandemic?'. See supporting information for the complete interview guide. Participants' definition of a 'neighbourhood' was asked in order to reflect on the geographic scale; participants defined their neighbourhood as 'in walking distance'. WJ had previously received interview training and had experience with conducting semi-structured interviews. She had no prior connection with the participants.

Participants were given the choice of interview location, including by telephone or video call, to ensure feelings of safety, comfort, and convenience; the majority of interviews were conducted in their homes. Only the participant and researcher were present, except that the participant's partner was present during the last part of one interview. An opportunity was given to participants to hold the interview by telephone or video call; in total two interviews were conducted by phone and two by video call. Written information about the study and the anonymity of the research, with the first author's contact information, was provided to each participant on the day of the interview. All participants gave permission to record the interview and provided informed consent to study participation. The interviews lasted about 50–70 minutes, and were conducted in a conversational style according to the interview guide, which provided open-ended questions that allowed participants to speak freely about what they felt was relevant and essential on the topic of age-friendly neighbourhoods. After each interview, the first author (WJ) composed a summary. The interview guide was tested in February–March 2020 with three older Surinamese adults (aged 70–76 years; 2 females, 1 male) who did not participate in the study. The results obtained guided the revision of the topic list (e.g. addition of questions, changing of topic order).

The Ethics Review Committee of Erasmus University Rotterdam approved this study (application no. 20-020) and determined that the rules imposed by the Dutch Medical Research Involving Human Subjects Act did not apply. The study is reported in accordance with the 32-item checklist of the Consolidated Criteria for Reporting Qualitative Research.

Data analysis

Thematic analysis was applied to the qualitative data. The interviews were transcribed verbatim and uploaded into Atlas.ti (version 9.0.16; Atlas.ti Scientific Software Development GmbH). Data were collected until all ethnic groups within

the Surinamese population were well represented and saturation was reached; a situation where no new information, concepts or themes emerged from the data. To avoid researcher bias, which may occur during interpretive data analysis, multiple researchers (WJ, JMC, SD, APN) were involved. The full transcripts were read for familiarization with the data, then structured and coded based on the eight age-friendly city domains. The researchers convened to establish a preliminary coding framework based on the WHO's age-friendly domains (community support and health services, social participation, respect and social inclusion, housing, outdoor spaces and buildings, transportation, communication and information, and civic participation). A code list was maintained throughout the initial coding process to track the development of codes and ideas regarding the data (e.g. the transportation domain consisted initially of the sub-codes 'car', 'public transport' and 'tailor-made transport', which were merged into the sub-code 'transportation options'). Constant comparison across and within interviews resulted in the development of sub-codes for the larger topics of neighbourhood age-friendliness and COVID-19. The first author coded the data deductively (i.e. following the theoretical framework for age-friendly cities) and inductively (i.e. stemming from participants' narratives). The research team then reconvened for discussion, refinement and the achievement of consensus on the coding structure. Any disagreement was resolved by discussion.

RESULTS

In total, 17 interviews were conducted with Surinamese Chinese (n = 2), Surinamese Creole (n = 5), Surinamese Hindustani (n = 8) and Surinamese Javanese (n = 2) older adults (10 female, 7 male) aged 71–85 years. A minority of the participants lived alone. Most of the participants had at least one chronic condition. The demographic composition of the study sample is shown in Table 1.

Overview

The study participants described aspects that increased and decreased the age-friendliness of their neighbourhoods, and suggested ways in which some of the barriers identified could be reduced. In addition, participants indicated shifts in priorities and perceptions of neighbourhood age-friendliness during the COVID-19 pandemic. Overall, the older Surinamese adults indicated that the age-friendliness of neighbourhoods played an important role in their community engagement and the provision of social support, especially during the pandemic. The COVID-19 pandemic had an impact on the experience of neighbourhood age-friendliness of

Table 1. Study participants

Interviewee	Age	Gender	District, Municipality	Ethnicity	Living situation	Health limitation
1	75	Female	IJsselmonde, Rotterdam	Surinamese Chinese	Independently, with others	
2	71	Female	Middelland, Rotterdam	Surinamese Chinese	Independently, with others	
3	76	Female	Prinsenland, Rotterdam	Surinamese Creole	Independently, with others	One chronic condition
4	75	Female	Liskwartier, Rotterdam	Surinamese Creole	Independently, alone	Walking difficulties, one chronic condition
5	77	Male	Transvaal, the Hague	Surinamese Hindustani	Independently, alone	Walking difficulties, multi morbidity
6	79	Male	Regentessekwartier, the Hague	Surinamese Hindustani	Independently, with others	Walking difficulties, one chronic condition
7	85	Male	Laak, the Hague	Surinamese Creole	Independently, with others	Walking difficulties, multi morbidity
8	74	Female	Regentessekwartier, the Hague	Surinamese Hindustani	Independently, with others	Walking difficulties, multi morbidity
9	84	Female	Schilderswijk, the Hague	Surinamese Hindustani	Independently, alone	
10	72	Female	Koningsplein, the Hague	Surinamese Hindustani	Independently, alone	
11	76	Female	Koningsplein, the Hague	Surinamese Hindustani	Independently, alone	Walking difficulties, multi morbidity
12	76	Male	Oude Westen, Rotterdam	Surinamese Creole	Independently, with others	
13	83	Female	Middelland, Rotterdam	Surinamese Creole	Independently, alone	
14	76	Male	Segbroek, the Hague	Surinamese Javanese	Independently, with others	
15	75	Female	Regentessekwartier, the Hague	Surinamese Hindustani	Independently, with others	
16	80	Male	Valkenboskwartier, the Hague	Surinamese Hindustani	Independently, with others	Multi morbidity
17	78	Male	Schilderswijk, the Hague	Surinamese Javanese	Independently, alone	

older Surinamese adults within the domains community support and health services, social participation, respect and social inclusion, outdoor spaces and buildings, transportation, communication and information, and civic participation, which are important lessons for policymakers. The analysis revealed sub-themes falling within the WHO's eight key dimensions of age-friendly cities.

Community support

Community and family support

Participants reported that they received practical and emotional support from their (grand)children and their neighbours. Whether (grand)children lived in the same neighbourhood (at walking distance) varied among participants; those who did offered more practical support, described as letter reading, filling out of forms, grocery shopping, cooking and collection of medication. Participants indicated that trusted people (e.g. their children), rather than others such as neighbours, read personal letters out loud and filled out forms related to their finances. One participant reported that her neighbour had a spare key in case of emergency. One participant reported that her neighbour rang the bell to see how she was doing and to have a chat when she had not seen her for a few days, which she liked very much. Another participant indicated that he kept an eye on a neighbour because she was in her nineties.

> *I also have a Surinamese Javanese neighbour. If she has not seen me for a day, she will tap on my window, 'Oh neighbour, I have not seen you. I have missed you'. Then we have a little chat. She keeps an eye on me. I like it, that she still does it. (Participant 9)*

So the neighbours have an essential role in keeping an eye on each other. Receiving support from neighbours and keeping an eye on each other contributed to participants being valued and part of society, increasing their social connectedness.

COVID-19 pandemic

Participants reported shifts in the support that they needed and received during the COVID-19 pandemic. For example, some interviewees reported that to avoid crowded places they went grocery shopping less often or not at all, and that their (grand)children and neighbours helped them with this task more often during the pandemic than previously:

> *For example, now with COVID-19, not everyone dares to go outside anymore. Fortunately, my children do the grocery shopping, so I do not have to go myself in the crowd. (Participant 7)*

The participants indicated that they appreciated this support. However, this support contributed to their feeling of being a burden, as they did their shopping themselves before the pandemic, these seemingly minor activities gave structure to their daily routines.

The interviewees reported receiving different degrees of emotional support from their neighbours during the pandemic. Some older Surinamese adults indicated that their neighbours asked them how they were doing more often than before the pandemic, whereas others indicated that they expected more emotional support from their neighbours. Participants received support from neighbours with whom they had regular contact before the pandemic, a majority of the participants indicated that these neighbours also had a Surinamese background. They indicated that support from neighbours is essential when one is vulnerable, such as during the pandemic. They reported that asking neighbours whom they did not know for help was less appealing, even during the pandemic. Some interviewees did not have broad neighbourhood social networks during the pandemic, and contact with neighbours was an important means of overcoming the barrier to asking for help. The interviewees described the current pandemic situation as difficult and lonely, and stated that they expected neighbours to keep an eye on each other, especially on the older population, as they were all in the same boat.

> *Also, in this situation [the COVID-19 pandemic], no one will come by to ask, 'How are you doing?'. And you are living in a residential community. I would like it if people would ask how I am doing or if they could do something for me. (Participant 11)*

The interviewees mentioned missing emotional support, such as an occasional hug, from their (grand)children during the pandemic. Some participants indicated that they (video)called their (grand)children to remain in contact. Although not all participants were digitally savvy, they tried to use their smartphones to keep in touch with their (grand)children during the pandemic, keeping to the advice to maintain physical distance. Even though, they understood the wisdom of maintaining physical distance, they reported feeling lonely more often than previously.

Health services

Support from healthcare providers

Most of the study participants indicated that they received domestic help, and some older Surinamese adults reported that they received support in activities of daily living, such as showering or dressing. Participants appreciated such support, as tasks such as making the bed had become difficult for them to perform:

I am not that young anymore and I cannot do everything myself anymore. I am glad that I receive domestic help. (Participant 5)

COVID-19 pandemic

The interviewees expressed their appreciation that district nursing and home care continued to be available during the pandemic, and that the measures needed to ensure this availability had been taken. They indicated that home care was essential for them, as it had an impact on their daily activities. Participants also reported that they had received more emotional support from home care professionals, during the pandemic. They indicated that more time was spent protecting their well-being, for example by chatting, than before the pandemic. The participants emphasised that they appreciated these professionals more during the pandemic, as they were the only people whom they saw regularly:

> *For example, I can no longer lift, which is why I need help. We [the domestic helper and participant] do certain things together. I am glad that she still comes during the pandemic. She is the one whom I see regularly. (Participant 9)*

This indicated that the receipt of help from care professionals (e.g. district nurses) is essential for older Surinamese adults' ability to continue to live independently. In addition, care professionals play a (more) important role in the provision of emotional support as well as care during a pandemic

Accessibility of health services

The interviewees indicated that they were satisfied with healthcare in the Netherlands, especially in comparison with that in Surinam. They perceived healthcare before the pandemic as accessible, as healthcare services such as general practitioners (GPs) practices and pharmacies were close to their homes. Most interviewees had known their GPs for several years and had good relationships with them, which they indicated was essential to make healthcare accessible and important as they grew older.

COVID-19 pandemic

Older Surinamese adults reported that going to see their GPs for 'small' things was difficult during the pandemic, as regular healthcare had been scaled down:

> *We older adults are already sensitive to everything, especially with the pandemic now. However, you cannot go to the GP for little things now. It is a pity. (Participant 16)*

They also mentioned that they did not know what they could expect from healthcare providers during the pandemic. They wondered how decisions about health-

care, especially for older adults, who are generally in poorer health than younger people, were made in this situation. Despite the implementation of solutions such as the home delivery of medication and digital solutions, the interviewees felt that healthcare was no longer as accessible as before the pandemic since efforts made to keep healthcare as accessible as possible during the pandemic, did not meet their needs.

Social participation

Neighbourhood activities

The interviewees' reported social participation in the neighbourhood varied, and included activities such as meeting for coffee, playing bingo, practicing yoga and being busy in an allotment garden. The interviewees indicated that these activities provided opportunities to be physically active and socialise with other people and functioned as a platform to meet people and foster new friendships. They also stated that such activities provided opportunities to remain engaged with and informed about their neighbourhoods. Older Surinamese adults reported that it was their own responsibility to maintain inclusion in the community by going to these neighbourhood activities, as it had a positive impact on their well-being. Most of the activities mentioned took place in the interviewees' own neighbourhoods. However, some older Surinamese adults indicated that they travelled long distances to community centres where activities were organised especially for older adults with Surinamese backgrounds (e.g. playing Surinamese games, singing traditional songs). The interviewees indicated that taking part in cultural activities, such as Deepavali (the festival of lights) or Surinam's Independence Day, was important to them, and that they travelled outside of their neighbourhoods when necessary to do so. They also mentioned that the participation of people from other backgrounds in such celebrations contributed to their feeling of connectedness. Participants indicated that people purposefully spoke Dutch during these celebrations to include the whole society:

> *For example, during Divali [the festival of lights], they [the community centre staff] throw parties. People from various backgrounds are present at these parties. (Participant 10)*
>
> *Yes, also multicultural. For example, we do not speak Surinamese here either, Srang Tongo, we speak Dutch. It is multicultural, so all people who are present can understand. (Participant 7)*

So, it is important for older Surinamese adults to stay in touch with their culture by going to cultural celebrations, even if they have to travel for this. These celebrations are accessible to all by speaking the Dutch language.

COVID-19 pandemic

Older Surinamese adults reported feeling a loss of engagement in purposeful activities (e.g. activities at community centre, volunteer work) during the pandemic. This loss strongly impacted most interviewees' daily lives, as they had previously engaged in neighbourhood activities several times a week. In addition, the interviewees reported feeling the loss of the social support that they received at these activities. Especially those who lived alone mentioned that they missed having contact with others with whom they could discuss things and that would help disrupt their rumination:

> *And when you go there [the community centre], you will have fun with other older adults. You can sing and talk with others. If you are worried about something, you can tell someone about it. However, now with the pandemic, that is no longer possible. Now you are alone at home. (Participant 10)*

They felt that a safe place had been taken from them and that they had received nothing in return, which contributed to their loneliness and feelings of loss of engagement with community life, feelings of exclusion, which eventually had a negative impact on their well-being. The social distancing rules had a detrimental impact on the social support that older Surinamese adults received during community activities, challenging their engagement with the community during the pandemic. Participants indicated that they felt lonelier during than before the pandemic. Participants maintained contact with friends from their community centres by telephoning them, but emphasised that this did not replace the physical contact that they had previously.

Participants adapted to the loss of activities in different ways; a minority of the participants indicated that they actively looked for activities in and around their homes (i.e. doing puzzles and gardening) to keep themselves busy, reflecting variation in resilience:

> *I used to go away a lot. But that is done now. I like culture, so now I read a lot and I do puzzles. My brain and memory are good and I want to keep it sharp. I can keep it sharp by taking an interest in what is happening today and by doing things that keep my brain active. (Participant 11)*

Thus, older Surinamese adults may find it challenging to cope with the loss of activities during the pandemic and require support to enable them to do this and to remain engaged in community life.

Respect and social inclusion

Social cohesion in the neighbourhood

The study participants indicated that they had lived in their current neighbourhoods for decades and knew their neighbourhoods well. They reported sharing joys and sorrows with neighbours whom they had known for decades, which contributed to a sense of belonging to the community. They stated that they knew the local people and stores and recognised familiar faces, which they perceived as inviting greetings and chatting (e.g. with shopkeepers):

> *You go to shops where the employees know who you are and know what you come for. We always have a chat. At home I am alone. So when you go outside, you can chat with someone whom you see regularly. You do not have to tell everything, but you can have a chat. (Participant 15)*

COVID-19 pandemic

Older Surinamese adults appreciated this attention from familiar people in their neighbourhood, which made them feel like a part of the community. During the pandemic they missed this attention as they had spent less time outside during the pandemic than previously. The participants indicated that greetings made them feel respected, and that one receives respect when one gives it to others.

Older Surinamese adults reported that the composition of their neighbourhood had changed over the years, with the loss of neighbours due, for example, to relocation or death. They stated that connecting with new neighbours was not always easy. For example, some interviewees indicated that their neighbourhoods now contained many students or young families, who are often busy. They stated that they would appreciate new neighbours' coming to introduce themselves because they feel it is important to know who lives where:

> *I am not very active in the neighbourhood; however, it is important to know your neighbours. Knowing you belong to the neighbourhood. When people see me walking on the street or see me standing at the bus stop, then they know 'Oh yes, that lady lives nearby'. (Participant 12)*

Participants indicated that it used to be common to introduce yourself to the neighbours, but not currently, which has negatively affected the social cohesion of the neighbourhood. Older Surinamese adults indicated that this was essential to know the neighbours, for example, in case of an emergency or to share information about the neighbourhood. The interviewees had mixed experiences with respect towards older adults in their neighbourhoods. For example, addressing someone regarding their behaviour was not always appreciated:

They [boys at the bus stop] started berating me. Say some words that you cannot say. I was with my walker and looked at them, but I said nothing. Otherwise, they would beat me up. Yes, I am afraid of those things. (Participant 8)

Participants felt that one must think about what one wants to say because some exchanges can lead to arguments, and they feared physical violence, which contributed to their feelings of vulnerability and exclusion and had a negative impact on the social cohesion of the neighbourhood.

Multicultural neighbourhoods

All study participants indicated that they lived in multicultural neighbourhoods (those populated by native people and people with migration backgrounds). They felt that the consideration of cultural norms and values was essential to show respect, as all of them lived in multicultural neighbourhoods. They noted that in general, older adults with, for example, Turkish or Moroccan backgrounds do not master the Dutch language well, making communication with them difficult. The interviewees indicated that they and such people greeted each other, but could not converse more (e.g. ask how the other is doing), which made connecting difficult. Some interviewees indicated that connecting with younger neighbours with Turkish and Moroccan backgrounds was easier, given their better mastery of the Dutch language:

I do feel that it is easier to get in touch with young people than older ones. Especially because the language is a barrier. Older adults who do not speak the Dutch language move a bit in their own group. (Participant 2)

Although participants could not communicate well with some of their neighbours who do not speak Dutch well, they felt it was important to share cultural practices with them, by sharing food. They stated that such experiences contributed to their feelings of connectedness and inclusion in the community.

Surinamese Creole participants indicated that they had felt discriminated against in the past due to their Surinamese backgrounds, but that the multicultural compositions of their neighbourhoods contributed to their feeling of connectedness with their neighbours:

A lot of people from the first batch are gone. Now I do not notice any discrimination here anymore. More migrants have also come to live here. The Dutch have made way for the migrants. It is also easier to make a connection. (Participant 3)

They felt that their cultural norms and values were more accepted currently than in the past, and they believed that this acceptance was also attributable to the multicultural compositions of their neighbourhoods.

Housing

Supportive residential complexes

Older Surinamese people indicated that features of their home environments affected their social lives, independence and, ultimately, well-being. They stated that barriers in their residential complexes (e.g. stairs) prevented them from going outside, and potentially impacted their ability to receive guests, as many of their friends were also older and would have difficulty, for example, using stairs. The interviewees, and especially those with mobility limitations, expressed their preference for features such as elevators, automatic doors and even floors, which facilitated their entry and exit from their buildings:

> *I am not mobile. You have seen, you just have to push those buttons and those doors fly open and we have an elevator. It is a bit of sheltered living. (Participant 11)*

This indicates that these features of the residential complexes in a neighbourhood have a great impact on the (daily) lives of older Surinamese adults.

Older Surinamese adults with mobility limitations had been offered home modification services, such as the installation of grab bars and removal of steps in their homes, to support them in their home environments. Interviewees with no limitation indicated that they were familiar with the municipal home modification programmes, but specified that modifications were offered only to those with health limitations, and not as preventive measures. They felt negative about the requirement that they had to be ill before they could modify their homes in a supportive manner; they believed that prevention would be better than a cure. One participant indicated that she had installed grab bars in her bathroom on her own, although she did not yet need them, so that she was prepared for the future.

Some interviewees indicated that they would like to live in senior housing, where they believed they would receive advanced support for older adults. However, they felt that staying in their neighbourhoods was essential. They noted that senior housing in their neighbourhoods was fully occupied, with long waiting lists:

> *You are 80 years old and you have to climb the stairs four high with the groceries. There are a lot of older adults who have to use stairs, which is an obstacle for them. One of the complaints that you have as you get older is knee problems. So, when they do not have an elevator, they do not want to go down and back up. There are senior residences in the area, but they are all occupied. (Participant 14)*

The interviewees further indicated that housing specifically for older adults with Surinamese backgrounds was present in their neighbourhoods. In addition, Hindustani Surinamese interviewees reported the availability of group living for

Hindustani Surinamese in their neighbourhoods. However, the preference for Surinamese-dedicated or regular senior housing differed among interviewees. Participants indicated that norms, cultural aspects, and traditional cuisine were important considerations contributing to their preferences, as was the need to move to another neighbourhood (with consequences for social contacts) due to the unavailability of housing specifically for older Surinamese adults in some interviewees' neighbourhoods.

Outdoor spaces and buildings

Accessibility in the neighbourhood

Interviewees without mobility limitations indicated that public buildings were accessible for them, but that they could imagine that places such as shops with narrow aisles would not be accessible for older adults with health impairments (e.g. walking or visual limitation). Those with mobility limitations indicated that most public buildings were accessible to them due to features such as automatic doors, doors that are propped open and elevators:

> *I think if you are in a wheelchair or when you have a walker, some places are difficult to access. Some shops. However, nowadays most shops have sliding doors or doors are kept open. So it is getting better for older adults. (Participant 17)*

Interviewees noted that the accessibility of public spaces was essential for social engagement since inaccessible public spaces prevented older adults with mobility limitations from meeting with others at these places.

Places to socialize with others

In addition to providing resting places, benches provided opportunities to socialise with others and contributed to the feeling of inclusion:

> *Having benches is also inviting to take a walk and then enjoy the weather. Sometimes you get talking to others. (Participant 1)*

It supported older Surinamese people's ability to go for walks and engage in active lifestyles. Interviewees described green spaces and parks as free and accessible places to meet up with friends and meet new people, which contributed to community engagement. In general, the interviewees had positive opinions regarding the availability of benches in their neighbourhoods. However, the accessibility of park locations appeared to differ among neighbourhoods. The interviewees also mentioned libraries as free and accessible places to meet others and cultivate one's interests, as well as places where activities and lectures were held. They indicated

that going to the library was an important way for them to take part in society and stay up to date:

> *Sometimes I go to the library at [...]. But now everything is closed. There are many people there, so you can meet other people there. All kinds of people, men, women, older adults. When I go there, I just talk with them. So, it is a way to meet new people and sometimes you keep in touch. (Participant 12)*

COVID-19 pandemic

Some interviewees indicated that they went for walks less often during the pandemic due to the lack of resting places, as public benches in their neighbourhoods had been removed or made unavailable. However, other interviewees indicated that benches with 1.5 m spacing of seats, according to the social distancing rule, were available in their neighbourhoods. Thus, the extent to which communities supported older adults' ability to go outside and engage with community life during the pandemic differed among neighbourhoods.

Neighbourhood facilities

The study interviewees stated that they appreciated having shops that carried traditional Surinamese herbs and vegetables in their neighbourhoods, as they had previously had to travel long distances to such shops:

> *It's nice to have a Surinamese toko nearby, sometimes you want to make a Surinamese dish. (Participant 6)*

They mentioned that the availability of a Surinamese toko in the neighbourhood contributed to their feelings of social inclusion and belonging.

COVID-19 pandemic

Older Surinamese adults valued having various destinations (e.g. different supermarkets, pharmacies, libraries, cafés) at walking distance in their neighbourhoods, as they made going for walks appealing. They also noted that features such as places to rest and public toilets supported them in going out and engagement with the community. They reported that the closure of public toilets during the COVID-19 pandemic reduced their confidence and discouraged them from going outside, and indeed they had spent less time outside during the pandemic than previously. They emphasised the importance of keep moving for their general health, especially when recommended by physiotherapists.

Transportation

Transportation options

The interviewees reported that they used various transportation options, depending on the distance of their destinations. Interviewees with mobility limitations reported that they used mobility scooters to travel longer distances, which allowed them to remain independent and supported them in going outside and taking part in society:

> *And I have a mobility scooter, which is very convenient for me. I would not be able to do my grocery shopping on my own if I did not have a mobility scooter. (Participant 13)*

The interviewees perceived public transport as a key resource that helped them to remain independent and participate regularly in community life. They were satisfied with the public transport in their neighbourhoods, as it was reliable and easy to use, with stops within walking distance from their homes and various options (e.g. tram, bus, metro). Interviewees with health and mobility limitations indicated that they preferred to use tailor-made transport (which was available specifically for people aged ≥ 75 years and those with such limitations) or travel by car as a passenger, because they were brought from door to door so that they did not have to walk long distances. Various travel options for older adults contributed to the age-friendliness of a neighbourhood, as older adults could decide for themselves what was feasible for them.

> *You can take tram 1, 9, 15. And on the other side there are other options. You can also take the bus. (Participant 14)*

COVID-19 pandemic

The study participants indicated that they had used public transport less during the COVID-19 pandemic, in part due to the cancellation of many activities in which they were previously engaged (e.g. social activities at community centres). In addition, despite the health and safety measures implemented for public transport use, they indicated that they would rather use tailor-made transport, where the limitation on the number of passengers made them feel safer:

> *Now with the pandemic, I do not want to make use of public transport. You do not know in advance how busy it is. With tailor-made transport they help you and there are fewer passengers. (Participant 5)*

Accessibility of transportation

The interviewees reported that the accessibility of public transport varied throughout their neighbourhoods, as some stops were lower than the vehicle entrances.

Especially for those who used walkers or wheelchairs, these stops were not accessible:

> *Sometimes stops are very low, which makes it difficult to get on or off the tram. They have made some stops a bit higher now, but not all of them. And you do not always know where the stops are too low. (Participant 2)*

Some interviewees suggested that public transport users should be made more aware of the accessibility of the next stop, such as by announcements made in the vehicles. In addition, they emphasised that they would appreciate extra time at stops to exit and enter public transport vehicles.

The study participants perceived tailor-made transport as a 'specialised service' that was more accessible for older adults than public transport. They indicated that the tailor-made transport staff seemed to be able to deal well with older adults, helping them to get in and out and putting on their seat belts. In addition, they waited until everyone was seated before driving, which was often not the case on public transport. The interviewees indicated that they appreciated these measures, and for this reason preferred to use tailor-made transport.

Communication and information

Information exchange

Some study participants reported that they communicated with their neighbours through WhatsApp, for example, to inform each other about neighbourhood activities, to alert neighbours of a bicycle in the way or to report noise nuisance:

> *We also have a group app with neighbours in it. If there is anything or when we want to give information about occasions in the neighbourhood, we forward it to each other. (Participant 7)*

Participants appreciated this way of communication because wider groups of people could be reached. However, not all study participants had smartphones enabling neighbourhood app use, suggesting that they would be excluded from relevant information about their neighbourhoods. The interviewees reported that their main source of information about neighbourhood activities and events was other people. They indicated that they received less information of this type during the pandemic, as they had less contact with other older adults whom they had previously met at neighbourhood activities (e.g. at community centres). The interviewees indicated that they received information about community care and support from their GPs. They also felt that their GPs could inform them about activities specific to older adults:

> *I think the GP can also help you with addresses, for example, about home modification. (Participant 2)*

These statements suggest that the social network is an important source of information about the neighbourhood, in addition, older Surinamese adults assume that they can obtain information about 'ageing' from their GP.

COVID-19 pandemic

Information about the current situation in the Netherlands regarding COVID-19, related measures and their relaxation has been provided through press conferences. The interviewees reported that they had watched the news on public broadcasting outlets to follow national and international developments regarding the pandemic. In general, they indicated that they had understood such information; when something was unclear to them, they had asked their children or someone in their social networks to clarify. Thus, their social networks had had impacts on the information that they received. Indeed, some interviewees mentioned the importance of having a broad network or social capital, which facilitates the collection of information:

> *You have to go after a lot of things yourself, if those people [acquaintances] have already done that for you, then they will tell you. Then you do not have to do it from the beginning, that makes a difference. (Participant 15)*

Participants reported that most of the (extra) information (e.g. fact sheets) about the pandemic provided by the Dutch government could be found online. Some participants indicated that they had access to this information through family members or friends who were well versed in digital technology. The majority of the participants indicated that they were unable to find this information themselves.

Civic participation

Volunteering

The interviewees emphasised the value of community centres, which offer neighbourhood activities and a place where older adults can volunteer. Many interviewees reported that they volunteered to keep themselves busy and in touch with others. However, the interviewees noted that older adults are not able to do everything they could do in the past, for example, due to reduced energy and that volunteer work should be designed to accommodate their capabilities. They described the community centres where they volunteered as open to everyone and as places where people could meet, learn, and socialise, which contributed to their well-being and their feeling of being valued.

COVID-19 pandemic

They mentioned that they missed their volunteer work, which had been suspended with the closure of community centres during the pandemic. They indicated that the disappearance of physical and social activities in which they had previously participated had impacts on their daily lives and social contact. Participants reported that volunteering gave them structure throughout the week and a sense of doing something useful. During the pandemic, the maintenance of such structure was challenging, which reduced their well-being. As mentioned in the section on neighbourhood activities, some participants actively looked for activities to keep themselves busy, but the degree to which they did so varied.

Making decisions about the neighbourhood

The study participants indicated that they were infrequently involved in decision making about their neighbourhoods, which they viewed as a pity, especially as they were getting older and had different needs:

> *And we older adults we grow older. What we need is, to live as comfortably as possible. You notice it when you get older, you will get other needs. (Participant 1)*

They mentioned that they would like to raise some points about neighbourhood issues, but that they did not know how or where to do so. Some interviewees felt that such raising of issues was pointless because they had already been 'written off':

> *We [the participant and partner] have made some suggestions in the past, but they did nothing with them. People from the municipality do not even look at it I guess. They have their own ideas. (Participant 5)*

These findings indicate that older Surinamese adults feel a need to be involved in choices made about their neighbourhood since their needs change as they grow older. This is especially important in order to adapt policies to the needs of older Surinamese adults.

DISCUSSION

This study was conducted to explore how older Surinamese adults in the Netherlands experienced their neighbourhoods' age-friendliness, as a vital city indicator, in general and during the COVID-19 pandemic. It provides novel insights into this experience and changes in this population's needs concerning neighbourhood age-friendliness during the pandemic. Experiences with the domains of community support and health services, social participation, respect and social inclusion, outdoor spaces and buildings, transportation, communication and information,

and civic participation changed during the pandemic. Several physical and social neighbourhood features were discussed which contributed to the age-friendliness of the neighbourhood (e.g. supportive residential complexes, transportation options); those that detracted from it included for example decision making about neighbourhoods without listening to the needs of older adults and the accessibility of healthcare during the pandemic.

The study participants emphasised the importance of neighbourhood features that had impacts on their social lives, such as social support and social participation, which supported their participation in community life and ultimately had positive impacts on their well-being. They also emphasised the importance of supportive neighbourhood features that enabled them to remain physically active and engaged with community life during the pandemic.

In line with previous research, this study showed that *community and family support* is essential for older Surinamese adults' experience of neighbourhood age-friendliness [15, 85]. Neighbours and (grand)children played prominent roles in the provision of support to the study participants. Participants expected more support from neighbours during the pandemic, but not all of them received it, which affected their resilience. Neighbourhoods in which social ties are strong tend to be more resilient, recover more easily and facilitate adaption to crises [86-88]. This study shows that in times of a pandemic support from neighbours has a more prominent role among older Surinamese adults, having an impact on their resilience.

The majority of the participants reported that they received support from neighbours with Surinamese backgrounds. Turkish and Moroccan migrants in the Netherlands are more strongly embedded in their neighbourhoods than are Dutch natives, which gives them more access to neighbourhood support [89], but this factor has not been explored for Surinamese migrants. Given our findings, we suggest that older Surinamese adults' ethnic backgrounds affect their receipt of support.

The loss of their social support systems, which included their (grand)children, neighbours and friends (from their community centres), as well as social cohesion in the neighbourhood seemed to have a negative impact on older Surinamese adults' well-being. Participants adapted to this situation by using technology to stay in touch with family and friends, however, this did not replace the physical contact with them that they had before the pandemic. Indeed, previous research showed that visiting family and friends, but not daily telephone or digital contact with them, was associated with better well-being of older Surinamese adults [90]; in other words, physical social interaction is more valuable than digital social interaction. Our findings and those of other studies [91, 92] indicate that although social technology is a way to stay engaged with family and friends even during a

pandemic, not all older adults have adapted to digital solutions and it surely does not replace face-to-face contact and the need for an occasional hug.

In the Netherlands, less-urgent healthcare was postponed and care was delivered remotely when possible during the pandemic, which affected the *accessibility of healthcare services* [93], as confirmed by the participants in this study. Although the Dutch healthcare system adapted to the pandemic by providing telephone and digital consultations, the participants did not mention these measures, suggesting that they did not contribute to the accessibility of healthcare for this population group. Indeed, research shows that certain social groups, such as migrants, are disproportionately affected by certain social responses during the pandemic [8-10].

Participants indicated that they received more *emotional support from district nurses* during the pandemic, which had a positive impact on their well-being. Given the pressure on home care in the Netherlands [94], it is especially important to find solutions for this since district nurses also give emotional support to older adults besides medical care. In times of the pandemic this was especially important for the participants.

In line with previous research [95], our findings show that *neighbourhood activities* provided opportunities for older Surinamese adults to have physically and socially active lives. Previous research on the loss of neighbourhood activities during the pandemic has focused mainly on quantitative outcome measures (e.g. the frequency of social interactions or receipt of social support) [47], rather than older adults' experience of this loss. This study revealed that older Surinamese adults felt socially excluded with the loss of neighbourhood activities and that it was challenging for the majority of participants to find activities that they could do during the pandemic, resulting in lower levels of well-being. Not all participants had the skills required to maintain positive adaptation to this loss, resulting in differences in resilience.

The Dutch government has provided tools to help people deal with the COVID-19 pandemic, but most materials have focused on how to comply with the measures implemented, rather than how to deal with the situation in daily life [96]. Telephone helplines were available to answer questions about COVID-19 [97]. However, the older Surinamese adults who participated in this study expressed that dealing with the impacts of the pandemic on their daily lives was challenging, suggesting that these resources do not meet the needs of this population.

This study showed that older Surinamese adults prefer to live in *residential complexes* that support their independence, which has a positive effect on their well-being. The current literature on ageing in place in the Netherlands focuses mainly on the general older population [22, 98-101]. As differences in age-related

wishes have been detected between and within migrant groups, the inclusion of and separate examination of migrant groups in such research is important [102] to improve policy development and the creation of age-friendly environments for all older adults. For example, Surinamese Hindustani interviewees in this study frequently raised the issue of the availability of group living specifically for older adults with Surinamese backgrounds, suggesting that this form of living is more popular in this group than in other groups with Surinamese backgrounds in the Netherlands. Indeed, previous research in the Netherlands has revealed differences in living preferences among Surinamese population groups; for example, Surinamese Creole people prefer to live independently, with or without care [103]. As some older Surinamese adults indicated that moving to senior housing in their neighbourhoods was challenging, as such facilities were fully occupied, recognition of the significance of supportive residential complexes for older adults is important. These complexes support older adults' maintenance of positive adaptions during ageing (e.g. with mobility limitations), enabling them to live independently and actively in their communities [104].

Participants did not mention any pandemic-specific factor in the *housing* domain, but as they spent more time in their homes during the pandemic, challenges that they experienced at home may have been especially important.

Participants identified several features that contributed to the age-friendliness of their neighbourhoods, supporting their engagement in community life and contributing to their feeling of *inclusiveness*. However, the degree of adaptiveness to support participants' well-being realisation during the pandemic differed across and within neighbourhoods. For example, changes in the *physical environments of their neighbourhoods* with the implementation of pandemic-related measures (e.g. making benches unavailable due to the 1.5-meter distance requirement) discouraged them from going for walks (e.g. because they had no place to rest). However, such changes that discouraged physical activity were not made in all interviewees' neighbourhoods, revealing differences in the extent to which neighbourhoods in the Netherlands supported older (Surinamese) adults' ability to go outside and engage in active lifestyles during the pandemic. Pandemic-related measures must consider the capabilities of older adults to help them maintain physically active lifestyles, as sedentary behaviour is associated with lower levels of health and well-being [105, 106].

With the rapid ageing of populations, the creation of environments that support (native and migrant) older adults' engagement in physically and socially active lives for the realisation of optimal well-being is essential. Research indicates that the involvement of older adults in the creation of age-friendly environments is essential for public health policy [107], as these residents experience challenges and

opportunities regarding age-friendliness. As a member of the WHO's age-friendly cities consortium, the Hague involves older adults in this manner [108]. Although not a consortium member, Rotterdam implements strategies for age-friendly city development, such as the provision of home modification options and free public transport for people aged ≥ 65 years [109]. However, the involvement of older migrants, with their distinct experiences and perceptions, in the development of age-friendly neighbourhoods remains rare. Indeed, our study shows that older Surinamese adults would like to be involved in *neighbourhood decisions*, but that they do not feel involved and do not know how they can contribute actively. In future research, investigation of the effects of differences in municipal policy on the experience of neighbourhood age-friendliness would be of interest.

In line with other findings [85, 110, 111], our findings suggest that the age-friendly domains are highly interconnected. For example, this study showed that participants had to travel long distances to community centres where Surinamese activities were organised. Presumably, older Surinamese adults with travel limitations were not able to attend these activities, resulting in social exclusion. Municipal policies must meet this population's need for Surinamese activities (*social participation*), which has an impact on their feeling of *social inclusion*. Second, research conducted mainly in large cities in the Netherlands has revealed that many older adults live in unsuitable homes [112]. Participants in this study emphasised the importance of having elevators in their residential complexes to make this form of *housing* suitable for them, as this factor affects their entry into and exit from the building, and thereby their social lives (*social inclusion/social participation*). Almost half of adults aged ≥ 65 years in the Netherlands live in unsuitable housing [113], and policies need to be adapted to address this issue. Lastly, this study showed that neighbourhood activities provided opportunities to be physically and socially active (*social participation*) and were essential for participants to remain engaged with and informed about their neighbourhoods (*communication and information*). Interactions between and within age-friendly domains should be considered during the development of age-friendly environments and policies. For example, places that older adults often visit, such as neighbourhood centres (*social participation*), could serve as the main locations where older adults can receive information (*communication and information*).

Strength and limitations

A strength of this study is the timing; the interviews were conducted during the second peak of COVID-19 in the Netherlands. Participants had already experienced the lockdown measures in the Netherlands at the time of the interviews; they had time to adjust to the situation, however, they were still experiencing

it. The inclusion of older adults with various Surinamese backgrounds in this study enabled us to capture an in-depth view of this heterogeneous population's experiences concerning age-friendly neighbourhoods during the pandemic in the Netherlands. In addition, the first author visited study participants in their homes, which enabled contact with vulnerable people who otherwise would not have been reached. The involvement of multiple researchers in the analysis reduced researcher bias. Despite these strengths, this study has several limitations. Its results apply only to the older Surinamese population in the Netherlands; findings in other population groups in the Netherlands and other countries may be different, despite the similarity of pandemic mitigation measures implemented across the world. In addition, the study participants lived in only two municipalities; future research should include older adults living in a more diverse range of municipalities to ensure better representation which will contribute to our understanding of the barriers to the implementation of age-friendly initiatives in the Netherlands. Additionally, given that this study is qualitative, we only investigated respondent's experiences of within and between neighbourhood variations.

Policy recommendations

Based on the findings of this study, we make several policy suggestions. First, this study revealed the importance of bench availability, which facilitates older Surinamese adults' walking in their neighbourhoods. This factor is especially important during a pandemic, when older Surinamese adults (and possibly older adults in general) are discouraged from walking outside when benches are not available. This factor has a negative impact on this population's social life, as benches are places where older Surinamese adults socialise with others. Outdoor spaces and built environments can be structured to promote mobility, socialisation and safety during a pandemic, such as with the provision of masks, handwashing stations and a variety of sanitised seating options in public places [114]. Stickers could be used to indicate where people can sit in accordance with social distancing rules.

Second, study participants indicated that the tools that the Dutch government provided during the pandemic did not meet their needs; they preferred social support, rather than helplines on which they could ask questions about COVID-19. Indeed, the removal of social barriers during the pandemic to reach migrant populations (e.g. at temples) seemed to be essential to inform them about COVID-19 vaccinations [115], emphasising the importance of social contact for older migrants. We recommend that the government make telephone lines available for volunteers to actively call older adults to ask about their well-being, which would enable monitoring and the provision of support to vulnerable individuals. Additionally, helplines do not require access to the internet or sophisticated digital

devices, making them accessible to older adults who are not digitally savvy. Telephone interventions have been shown to effectively reach socially isolated older adults and improve their well-being [116].

Policymakers could use the findings of the current study to inform their assessment of current policies and to guide future actions and interventions undertaken by various stakeholders, such as municipalities and community organisations. Our findings may also help municipalities to identify gaps in current policies.

CONCLUSION

Research shows that older adults are less likely to be prepared for crises and may experience challenges in responding to crisis situations due to advancing age [117], this especially holds for older migrant populations. Age-friendly neighbourhoods have been shown to support older adults in responding better in times of crisis [18, 20]. This study showed that certain age-friendly features promoted older Surinamese adults' positive responses to the negative experience of the pandemic. However, resilience seemed to differ within and across neighbourhoods during the pandemic (e.g. support for the maintenance of physically active lifestyles). Some neighbourhoods adapted to such challenges and others did not, reducing older adults' opportunities to realise well-being needs together (a prerequisite for community development) [3,4]. As parts of vital cities, age-friendly neighbourhoods offer supportive and adaptive living environments that enable older residents to age within them and optimise their well-being [1, 2]. Participants who lived in neighbourhoods with strong social networks seemed to be better supported by their neighbours during the pandemic, indicating that these networks are essential resources. Resources in the neighbourhood, such as supportive neighbours, provide a context for individual resilience on the neighbourhood level [118]. Involving older (Surinamese) adults in the development of age-friendly public policies (related to COVID-19) in the Netherlands could help age-friendly neighbourhood development, as an indicator of a vital city, and make the pandemic manageable for this population.

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6 Views of older Surinamese adults about age-friendly neighbourhoods and their well-being realization: A Q-methodology study

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ABSTRACT

In the western world, the ageing population is becoming more ethnically diverse. Research has shown the importance of physical and social neighbourhood resources for the well-being realisation of older adults. However, the relative importance of neighbourhood resources for the well-being realisation of older Surinamese adults remains unknown. We conducted a Q-methodology study in April–July 2022 to capture the variety of viewpoints of older adults (age ≥ 65 years) with Surinamese backgrounds in the Netherlands on neighbourhood age-friendliness and well-being realisation. A purposive sample of 33 participants ranked 38 neighbourhood-related opinion statements according to their importance for their well-being and explained their rankings during follow-up interviews. By-person factor analysis of the data was conducted to identify common patterns in the statement rankings. Three distinct viewpoints in which various aspects were considered to be important were extracted: 1) a safe neighbourhood in which to stay socially active, 2) a supportive neighbourhood in which to stay independent and 3) a well-maintained neighbourhood with involved residents. These results suggest that not all older Surinamese adults in the Netherlands find the same neighbourhood resources to be important for the realisation of well-being.

INTRODUCTION

In the Western world, the ageing population is becoming more ethnically diverse. In the Netherlands, Surinamese people form one of the largest groups with non-western migration backgrounds and are concentrated in neighbourhoods in large cities [1]. Research has shown that physical and social neighbourhood resources affect the well-being of older adults [2-7]. For example, accessible green spaces provide opportunities for relaxation and social and physical activities [8], and social cohesion and support among neighbours provide affective support, increase self-esteem and enhance mutual respect [9]. With ageing, people may experience physical, psychological and social changes (e.g. mobility limitations, reduction of social networks), making them more likely to depend on neighbourhood resources. A safe and convenient living environment can support older adults' adaptation to such changes and contribute to their well-being [7].

Age-friendly cities are urban environments in which older adults are actively involved, valued and supported, with physical and social infrastructure and services that effectively accommodate their needs [10]. The age-friendliness of a neighbourhood can be described in terms of resources in eight domains: outdoor spaces and buildings, transport, housing, social participation, respect and social inclusion, civic participation, community support and health services, and communication and information [11, 12]. Research on neighbourhood age-friendliness in the Netherlands has focused mainly on the general older population, with the underrepresentation of older adults with migration backgrounds [13-15]. As cultural factors influence individuals' attitudes toward ageing [16], neighbourhood interaction [17] and well-being [18, 19], requirements for age-friendly neighbourhood development for well-being realisation may differ between native Dutch and migrant older people (see Nieboer & Cramm, 2022 for further theoretical elaboration [20]). Although neighbourhood age-friendliness is known to positively affect the well-being of older adults, little is known about how such neighbourhoods are related to older adults', and especially older migrants', realisation of well-being [21].

In the Netherlands, older adults with migration backgrounds are more likely to live in disadvantaged and less-maintained neighbourhoods than native older adults [22, 23]. In general, such neighbourhoods have poor housing conditions and reduced accessibility to physical and social infrastructure, which can have negative impacts on the realisation of well-being. Various neighbourhood resources are known to be essential for older people's well-being realisation [2-7]. However, the relative importance of these resources and how older Surinamese adults in the Netherlands experience them remain unclear. This study was conducted to exam-

ine this population's viewpoints on their well-being realisation in their neighbourhoods. This study contributes to the promotion of more inclusive policies for older adults to grow old in their own neighbourhood that meet the demands of diverse groups of older adults.

METHODS

Population

The Surinamese population is one of the largest groups with non-Wester backgrounds in the Netherlands. Surinam, located on the north-eastern Atlantic coast of South America, obtained independence from the Netherlands in 1975. Its population is diverse in terms of culture and geographic origin and includes Surinamese Chinese, Surinamese Javanese, Surinamese Creole (of West African descent) and Surinamese Hindustani (of Indian descent) individuals [24]. The majority of Surinamese individuals in the Netherlands have Surinamese Creole and Surinamese Hindustani backgrounds. Most Surinamese people speak Dutch well, as it is an official language of Surinam; this characteristic distinguishes this group from other migrant groups in the Netherlands.

Almost 13% of the older Surinamese population in the Netherlands is aged ≥ 75 years [25]. The majority of older Surinamese adults live alone, and slightly more than half are women [25]. In general, the socio-economic status (e.g. education and income levels) of older Surinamese migrants is lower than that of older Dutch natives [26]. Surinamese people have worse health than native Dutch people; they are more likely to develop (multiple) chronic diseases [27, 28]. Additionally, social frailty (e.g. living alone, having little social support) seems to be more prevalent among Surinamese than among native Dutch older adults [29], suggesting that the former have weak social networks and are thus more likely to depend on neighbourhood resources. A recent literature review confirmed that the research on the well-being of older migrants, including older Surinamese people, in the Netherlands is scarce; included studies examined the well-being of older Moroccan and Turkish, but not Surinamese adults [30]. Thus, research on the well-being of older Surinamese migrants in the Netherlands is needed.

This study was conducted in four cities in the Netherlands, namely: Amsterdam, Rotterdam, the Hague and Utrecht. In 2022, the majority of older adults with a non-Western migration background lived in these four cities [25]. Participants were recruited living in different districts of these cities to secure variation within the study population (Figure 1). Eligible individuals were community-dwelling and had not been abroad for >6 months in the previous year. The Ethics Review Com-

mittee of Erasmus University Rotterdam approved this study (no. ETH2122-0125), and all participants provided written informed consent to study participation and audio recording of the interviews.

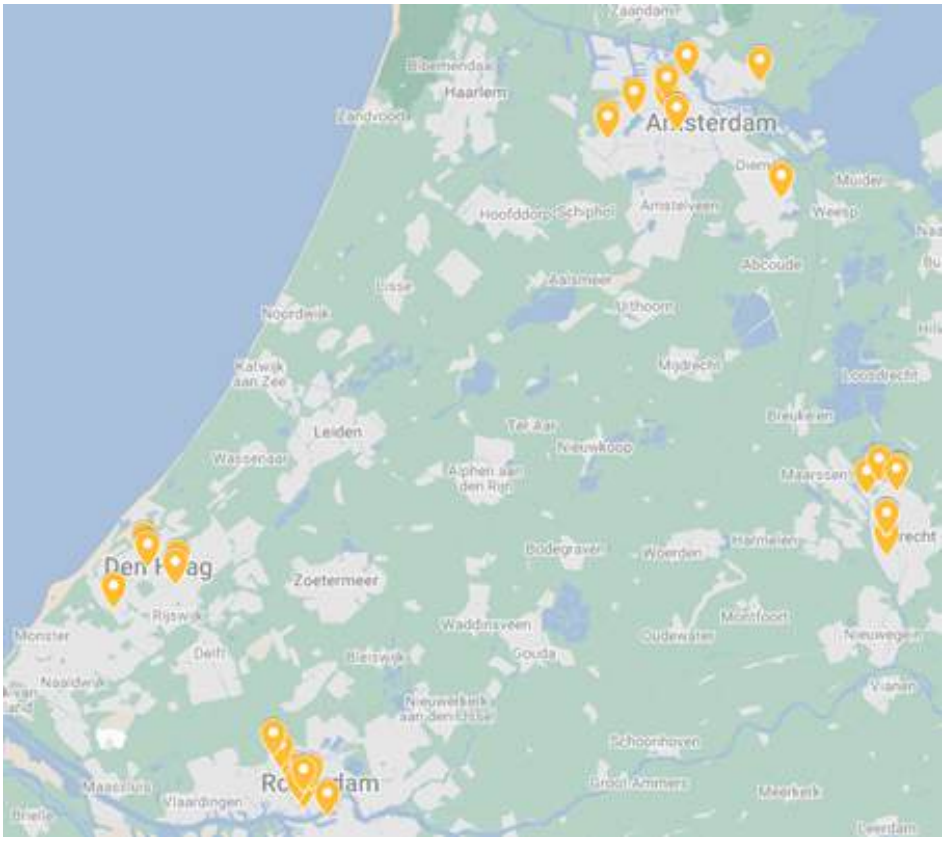

Figure 1. Overview of the neighbourhoods in which participants lived in Amsterdam, Rotterdam, the Hague and Utrecht.

As the aim of Q-methodology research is to explore the variety of viewpoints that people hold, and not to make claims about the people expressing them, participants were recruited by purposive sampling and in different districts of the target cities to ensure diversity. Multiple recruitment strategies, including the leveraging of the first author's (WJ's) network, community canvassing, social media posts and snowball sampling from an initial set of participants, were used. The Network of Older Migrants' Organizations (*Netwerk Organisaties voor Oudere Migranten*) facilitated contact with key community members, whom the first author visited or called to explain the goal of the research and what would be expected during the interviews held for the study. These key community members then

introduced the first author to potential participants, who were provided with written materials containing information about the purpose of the study, what could be expected during the interviews, and the first author's contact details. A small financial incentive (30-euro gift voucher) was used to help recruit participants.

Design

This study was part of a larger research programme examining well-being realisation and age-friendly neighbourhoods for older native and migrant adults in the Netherlands [20]. It was performed using the Q-methodology, which combines qualitative and quantitative methods for the systematic examination of experiences and perspectives (i.e. beliefs, opinions, values) [31, 32]. A Q-study entails the following three steps: 1) Q-set development, 2) data collection, and 3) statistical analysis and factor interpretation.

Q-set development

A set of opinion statements (Q-set) was developed to identify factors that older Surinamese adults considered to be essential to their well-being realisation in their neighbourhoods. A literature review was conducted to identify potentially relevant factors, based on the World Health Organization's (2007) framework for age-friendly cities and other relevant literature, such as policy documents. A full list of publications consulted during Q-set development is provided in the Appendix. The research team identified recurrent themes and concepts as relevant for the measurement of the age-friendliness of neighbourhood resources for inclusion in the Q-set (Table 2). The comprehensibility and unambiguity of the statements in the initial Q-sets were assessed during pilot interviews with participants, and these participants' responses and comments were considered in weekly meetings of the research team. Any ambiguity revealed by several participants' responses resulted in the adjustment of a statement, followed by a reassessment of the statement's perceived meaning in an interview with a new participant. Thus, the Q-set was developed iteratively, with interview responses serving as feedback about its usability. This approach enabled the validation of Q-set development. The entire process continued until interviews no longer provided new findings. The statements in the final Q-set were printed on equally sized and styled cards. A forced-choice grid was developed for participants' sorting of the statements; it had a quasi-normal and symmetrical distribution ranging from –4 (least important) to 4 (most important; Figure 2).

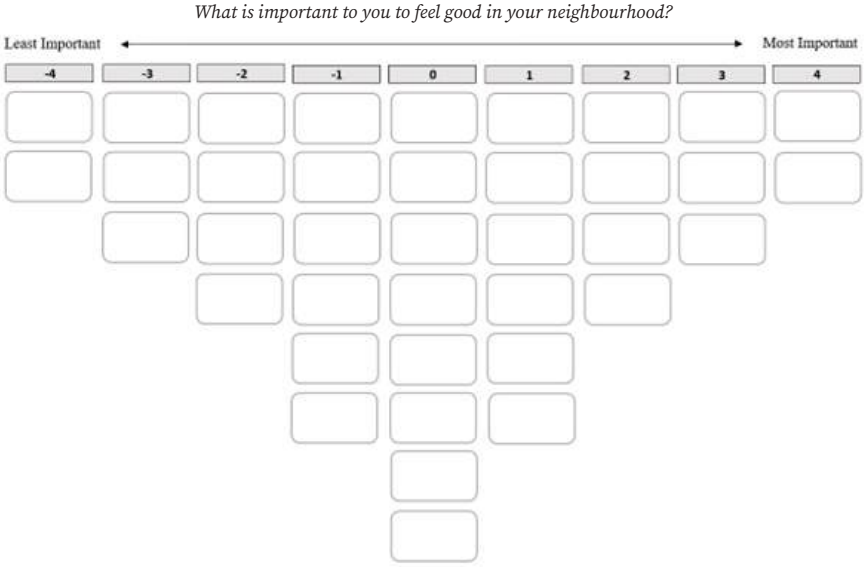

Figure 2. The sorting grid

Data collection

The first author conducted individual interviews (~1 hour long) at participants' homes, in public places (e.g. neighbourhood centres) and at Erasmus University Rotterdam in April–July 2022. The interviews were audio recorded. Each participant was provided with an introduction letter, an informed consent form, the Q-set statements and the sorting grid. Following an explanation of the process, the participants were asked to sort the statements according to their relative importance for well-being realisation in their neighbourhoods. The interviewer asked the participants 'What is important to you to feel good in your neighbourhood?' and then read the statements and showed them to the participants to acquaint them with the complete Q-set. Next, the participants sorted the statements into 'important', 'I do not know/no opinion', and 'not important' plies. They re-read the statements in the 'important' pile and ranked them from most to least important using the sorting grid (Figure 2). They then repeated this process with the statements in the 'I do not know/no opinion' and 'not important' piles, filling the entire grid. The participants were asked whether they were satisfied with their rankings and given the opportunity to make adjustments to best reflect their perspectives. The interviewer then asked the participants to elaborate on their rankings, starting with the three extreme columns on the sorting grid and proceeding to the other columns. Finally, the participants were asked to summarise their perspectives on well-being realisation in their neighbourhoods. After the interview, they were

asked to fill out a questionnaire to provide information about their background characteristics, health and well-being.

Analysis

The data were analysed using the PQ Method software package (version 2.11) [33]. By-person factor analysis was used to identify significant clusters of correlations among rankings, under the assumption that participants who ranked the statements identically had similar perspectives (comprising a factor). The Kaiser–Guttman criterion (eigenvalues > 1) was used to determine the number of factors extracted [34, 35]. Each factor represented a viewpoint held by study participants on essential neighbourhood resources for well-being, with some statements having higher loadings (i.e. greater relative importance) than others. All Q-sorts belonging to a factor were merged by weighted averaging to form a factor array. These arrays showed which neighbourhood resources were most important according to different viewpoints (Table 2), and formed the basis for different forms of factor interpretation. To fully understand and explain the shared viewpoints, the patterning of items in the factor arrays was examined, with the consultation of comments and explanations that respondents gave during the Q-sort and interviews. The interpretation of the qualitative data helped to explain the statements' importance and to characterise older Surinamese adults with similar perspectives.

Although all statements were considered in relation to each other, characterising and distinguishing statements for each factor were identified. Characterising statements had rankings of –4, –3, 3 or 4 and were considered to provide insight into the content of the factor (i.e. viewpoint). Distinguishing statements had rankings that differed significantly ($p < 0.05$) between the examined factor and other factors, and were considered to represent crucial differences between viewpoints. In the Results, distinguishing statements are indicated with *. The verbal comments that participants with a given exclusive viewpoint provided during the Q-sort and follow-up interviews were used to aid and supplement the interpretation of that viewpoint (factor). Finally, statements whose rankings did not differ significantly between any factor pair were taken to be consensus statements and were examined to obtain information about issues with which participants with all viewpoints (dis)agreed.

RESULTS

Thirty-three individuals [20 women and 13 men, mean age 75 (range 65–90) years] participated in the study. Their socio-demographic characteristics are presented

in Table 1. The participants' educational levels ranged from elementary school completion or less to university. Twenty-two participants lived alone. Ten participants lived in Amsterdam, nine lived in Rotterdam, six lived in the Hague and eight lived in Utrecht. Four participants had Surinamese Chinese backgrounds, 8 had Surinamese Creole backgrounds, 3 had Surinamese Javanese backgrounds, and 16 had Surinamese Hindustani backgrounds; two participants had mixed backgrounds. Twenty-one participants had chronic conditions, of whom 15 had multimorbidity.

Table 1. Descriptive statistics of the study participants (*n* = 33)

	Mean (SD) or percentage	Range
Age (years)	75.18 (6.57)	(65 – 90)
Gender (female)	60.6	
Education[a] (low)	27.3	
Living situation (alone)	66.7	
City		
- Amsterdam	30.3	
- Rotterdam	27.3	
- The Hague	18.2	
- Utrecht	24.2	
Cultural background		
- Surinamese Chinese	9.1	
- Surinamese Creole	27.3	
- Surinamese Javanese	9.1	
- Surinamese Hindustani	48.5	
- Mixed	6.1	
Chronic disease	63.6	
Multimorbidity	45.5	

[a] = educational level completed in the Netherlands or abroad

The definitive version of the Q-set comprised 38 statements (Table 2). The analysis revealed three factors representing distinct viewpoints. Data from 24 participants were associated significantly with one of these factors (factor 1, *n* = 13; factor 2, *n* = 6; factor 3, *n* = 5; Table 2). Descriptive statistics for each factor are presented in Table 1 of the Appendix.

Table 2. Statements and factor loadings

WHO Domains and Statements	Viewpoints		
	Factor 1[a]	Factor 2[b]	Factor 3[c]
Outdoor spaces and buildings			
1. A clean and well-maintained neighbourhood	+2	+2	+4*
2. Plenty of green	0*	-1	-2
3. Benches	-2	-1	-1
4. Good sidewalks and crosswalks	0	+1	0
5. A safe neighbourhood	+4	+1*	+4
6. Accessible buildings	0	0	-1
7. No nuisance	+4*	-2*	+1*
8. Public toilets	-4*	-2	-1
9. Beautiful buildings	-3	-4	-3
Transportation			
10. Good public transport	+3*	0	0
11. Special transport for older adults with a disability	+1	+1	0
12. Sufficient parking spaces	0	-1	+1
13. Cycling and walking trails	-2	0*	-2
Housing			
14. Affordable housing	+1	0	+1
15. Suitable homes for older adults	+2*	+3	0*
Social participation			
16. A neighbourhood where social/cultural activities are organized	0	+2	+1
17. Affordable activities	-3*	0*	-2
18. A meeting place for older adults	+2*	0*	-2*
19. Activities especially for Surinamese people	0	-3	-4
Respect and social inclusion			
20. A neighbourhood where people have respect for older adults	+3	+2	+3
21. A neighbourhood where people know each other	+1	-2*	0
22. Friends and/or family in the neighbourhood	-1	-3*	-1
23. A neighbourhood with people from the same background	-4	-4	-4
24. No discrimination in the neighbourhood	0	+1*	0*
25. Contact between young and old in the neighbourhood	-1*	0*	+3*
Civic participation and employment			
26. Opportunities to volunteer	-3	0*	-3
27. A neighbourhood where older adults have a say	+1	-1	0
28. Availability of courses or trainings in the neighbourhood	-2	-3	-1
Communication and information			
29. Understandable information about facilities and activities in the neighbourhood	-1*	+1	+2*
30. Municipal information in a central place	-1	-1	+2*

31. A neighbourhood where people keep each other informed about what happens	+1	-2*	+2
Community support and health services			
32. A neighbourhood where care at home is easy to get	+2	+3	+2
33. A neighbourhood where care providers work together and inform each other	-1*	+2	0
34. The general practitioner and pharmacy in the neighbourhood	+1*	+4*	-3*
35. A place where I can go for advice and support	0	+1	+3*
36. Volunteers who provide assistance when needed	-1*	+3*	+1
37. Shops and other amenities in the neighbourhood	+3*	+4	-1*
38. Sports facilities in the neighbourhood	-2*	-1*	+1*

[a] = A safe neighbourhood in which to stay socially active, [b] = A supportive neighbourhood in which to stay independent, [c]= A well-maintained neighbourhood with involved residents. * = Distinguishing factor

Viewpoint 1: A safe neighbourhood in which to stay socially active

Participants holding viewpoint 1 find it important that there is a good relationship among neighbours, which contributes to a safe neighbourhood and no nuisance. As the majority of the participants live alone (Appendix Table 1), they are independent, socially active and like to go out. Public transport supports them in doing so. They also find it important that local facilities such as shops, public transport and meeting places for older adults are well arranged.

Participants with viewpoint 1 value a neighbourhood where they feel ***safe*** (statement 5, +4), without ***nuisance*** (statement 7, +4) to realize well-being. They described vandalism and loiterers as nuisances associated with not feeling safe in their neighbourhoods: '*They* [loiterers] *cause noise nuisance and you automatically feel less safe with those loiterers. It is scary when they hang out together*' (Participant 20). For neighbourhood safety, they indicated that it would be important to address someone about these individuals' behaviour, but they did not do so themselves because they did not know how people would respond and even feared physical violence. Although these participants valued neighbourhoods with good social ties, including **knowing people in the neighbourhood** (statement 21, +1), they did not want excessive contact with their neighbours: '*It is important to know who your neighbours are, however, I do not hang out with my neighbours every day. I would not want that either*' (Participant 32). Additionally, these participants valued neighbourhoods in which people treat each other with **respect** (statement 20, +3), regardless of age and ethnicity: '*There should be respect for everyone, not only our* [Surinamese] *people, but for the whole neighbourhood*' (Participant 4). They indicated that people with different ethnicities and cultures can learn from each other, and thus did not prefer neighbourhoods with **people from the same background** (statement 23, –4): '*There must be a mixed society, there must be togetherness, which is the most important thing among the people. They must understand each other, have*

respect for each other and learn from each other' (Participant 13). They expressed that a neighbourhood with exclusively Surinamese people would only lead to *'gossip and quarrels*' (Participants 4, 8, 13, 20, and 23). Participant 8 stated, '*And what I absolutely would not want is a specific neighbourhood with only Hindustani people, I would feel very unhappy* [...]. *That gossip does not interest me*.'

To stay independent, participants holding viewpoint 1 found the good organisation of neighbourhood facilities to be essential. For example, **good public transport** (statement 10*, +3) supported their ability to go to places they liked, engage in activities and have a socially active life: '*And I also think that public transport is important because it takes you where you want to go and keeps you among the people*' (Participant 23). They also indicated the importance of **shops and other amenities** (statement 37*, +3), including **meeting places for older adults** (statement 18*, +2), in the neighbourhood. They felt that the latter contributed to their well-being, as they provide opportunities to be socially active, may prevent loneliness and help them to keep an eye on one another: '*Yes, you also hear stories from others and then you are also alert, "Oh that is going on with her", then you keep an eye on it, ask about it the next time. It is also the social control, that you can also help the other*' (Participant 28). They appreciated the availability of Surinamese activities in their neighbourhoods, as they provided opportunities to share memories about Surinam with each other and to enjoy Surinamese music and food. However, the participants emphasised that **activities especially for Surinamese people** (statement 19, 0) should be accessible to everyone to avoid discrimination. These activities contributed to their well-being, as they provided opportunities for social support: '*You also hear stories from each other during social gatherings, what is going on at home. You can then give each other advice, for example, if you notice that your husband is behaving differently and think it is dementia*' (Participant 28). This factor may explain why participants holding viewpoint 1 did not consider **places to go for advice and support** (statement 35, 0) and **volunteers who provide assistance when needed** (statement 36*, –1) to be important for their well-being.

Despite these participants' valuing of neighbourhoods that support their social activity, they did not consider activities such as **courses** (statement 28, –2), **sports facilities** (statement 38*, –2) and **volunteer opportunities** (statement 26, –3) to be important. They indicated that activities did not have to be **affordable** (statement 17*, –3), but rather thought that they should be completely free of charge.

Considering the future, participants with viewpoint 1 indicated the importance of **receiving care at home** (statement 32, +2) for their well-being: '*Yes, of course, because if I cannot do it [take care of myself] anymore when I am older, I would like it if I could get care at home'* (Participant 20). '*When you get housebound, you also want to have care at home. That someone can come to you, the general practitioner can come to*

you and they can also send someone to take care of you. Things like that are important when you get older' (Participant 8). They felt that **suitable homes for older adults** (statement 15*, +2) were needed, as they anticipate the need for home modifications in response to potential future physical limitations.

Viewpoint 2: A supportive neighbourhood in which to stay independent

More participants holding viewpoint 2 than those holding the other viewpoints were vulnerable (e.g. had health and/or walking limitations) or had vulnerable partners. The age-friendly domain most characterising this viewpoint is community support and health services. As the majority of participants with this viewpoint had health limitations and lived alone, they depended a great deal on formal and informal care and support and valued neighbourhoods in which such services were accessible and arranged well. In addition, they found the availability of suitable homes for older adults and shops and activities within walking distance to be important because these facilities support their ability to continue to live independently at home despite their physical limitations.

Participants holding viewpoint 2 valued neighbourhoods with a **general practitioner and pharmacy in the neighbourhood** (statement 34*, +4) and **where care at home is easy to get** (statement 32, +3). Many of them did not have family living nearby and required on-site help quickly when needed: '*Suppose something happens to me, then the general practitioner can come quickly*' (Participant 26). They considered it to be important that **care providers work together and inform each other** (statement 33, +2), as such cooperation contributes to the quality of their care and ultimately their well-being. Participants, and especially those with vulnerable partners, also emphasised the importance of having **volunteers who provide assistance when needed** (statement 36*, +3) to support their ability to continue living at home. They found **knowing people in the neighbourhood** (statement 21, –2) to be unimportant, but emphasised the importance of having strong social ties with their immediate neighbours, who were crucial in providing support: '*I do not have family or friends nearby, however, you have to be good with your neighbours, because they are the first to arrive*' (Participant 2). In the presence of such support from neighbours, and with the ability to stay in touch using smartphones, these participants did not find having **friends and/or family in the neighbourhood** (statement 22*, –3) to be important.

Participants holding viewpoint 2 found living in a **suitable home for older adults** (statement 15, +3) to be essential, for practical (e.g. having an elevator, wide doorways) and safety (no obstacles, burglar proof, alarm button) reasons. They valued the **safety** of their neighbourhoods (statement 5*, +1) and homes: '*I spend a lot of time at home, so for me it is also important to be safe at home. For example, I have*

a pendant when I push on the button, there will help right away' (Participant 26). To enable their independent living, they also valued having (especially Surinamese) **shops and other amenities in the neighbourhood** (statement 37*, +4) and **social/cultural activities** (e.g. Surinamese cooking; statement 16, +2). The availability of activities at accessible locations within walking distance enabled these participants to be outside and share with others. The participants stated that activities did not have to be **especially for Surinamese people** (statement 19, –3) and did not have a preference for **a neighbourhood with people from the same background** (statement 23, –4). They indicated that Surinam and the Netherlands have multicultural societies, and people should not form groups based on their backgrounds: '*Well, we live in the Netherlands, don't we? Here it is mixed anyway. In Surinam we also lived together, so why not here?*' (Participant 21).

Viewpoint 3: A well-maintained neighbourhood with involved residents

Participants holding viewpoint 3 found the appearance and safety of their neighbourhoods to be important, and expected residents to contribute to these aspects. They also found being well-informed and having information accessible to everyone to be important.

Older Surinamese adults holding viewpoint 3 valued **clean, well-maintained neighbourhoods** (statement 1*, +4), which gave them and others positive outlooks: '*A neighbourhood that is clean and well-maintained also gives me a feeling of happiness. It is also the image towards the people who do not live in the neighbourhood*' (Participant 27). They emphasised that residents were responsible for keeping their neighbourhoods clean, for example by throwing their garbage in, rather than leaving it next to, containers, but also viewed the facilitation of cleanliness as a municipal responsibility. For example, they spoke of the need for the municipality to provide sufficient numbers of trash cans, especially where people come together to socialise (e.g. near benches). Additionally, these participants valued **neighbourhood safety** (statement 5, +4), to which they expected neighbours to contribute by **keeping each other informed** (statement 31, +2): '*You can also hear from each other about certain things to keep the neighbourhood safe'* (Participant 27). They emphasised the importance of **understanding information** (statement 29*, +2) and having **municipal information in a central place** (statement 30*, +2), to prevent them from being sent 'from pillar to post'. They stated that having **a place to go for advice and support** (statement 35*, +3) and **contact between young and old in the neighbourhood** (statement 25*, +3) could help them to be well-informed because they were not digitally literate: '*I think that is important, such a place [where I can go for advice and support]. It must also be accessible to everyone, so that you also*

know where to go for advice for example for digital issues. Because some people do not know where to go' (Participant 1).

Participants holding this viewpoint were active mainly in their own social circles (e.g. family and friends) and thus had no preference for **a meeting place for older adults** (statement 18*, –2), **activities especially for Surinamese people** (statement 19, –4) or **volunteer opportunities** (statement 26, –3). As they often visited and hosted family and friends, they considered the availability and affordability of **sufficient parking spaces** (statement 12, +1) to be important: '*It is important for visitors, people no longer like to come to us. "Yes, it is so difficult to park at your place". If they have to drop off something, they do it through the letterbox. You are lonely, so to speak. I get fewer and fewer visitors, my own children do not like coming either, it is now also paid parking every day, which quickly adds up*' (Participant 1). They did not have a preference for **a neighbourhood with people from the same background** (statement 23, –4) because they believed that exposure to distinct cultures, such as by sharing food on culturally important occasions, enriched one's life. They also emphasised the importance of **respect for older adults** (statement 20, +3) regardless of cultural background, including greeting each other, chatting and offering help when needed.

Consensus among viewpoints

Although the three viewpoints are distinct in many respects, they also reflect agreement on several age-friendly factors that contribute to well-being. Participants with all viewpoints found a **neighbourhood where home care is easy to get** (statement 32, +2/+3/+2) to be essential and did not find **courses** (statement 28, -2/-3/-1) or **benches** (statement 3, -2/-1/-1) to be important. The participants indicated that benches made it easier for them to go for a walk, but ranked them as unimportant because they also attract loiterers. In addition, all three viewpoints were in consensus on two items in the respect and social inclusion domain. Participants valued **a neighbourhood where people respect older adults** (statement 20, +3/+2/+3): '*Respect for older adults, that is how it should be. Have a chat with them if everything is okay with them. So always involve older adults and do not leave them behind*' (Participant 1, viewpoint 3). They did not feel that **a neighbourhood with people from the same background** (statement 23, -4/-4/-4) was important for their well-being.

DISCUSSION

With increasing numbers of ethnically diverse older people in certain neighbourhoods, the interest in and urgency of creating age-friendly neighbourhoods that support older migrants' realisation of well-being is growing. This study explored the relative importance of age-friendly neighbourhood aspects for the well-being realisation of older Surinamese adults in the Netherlands. Three distinct viewpoints were identified: *a safe neighbourhood in which to stay socially active, a supportive neighbourhood in which to stay independent*, and *a well-maintained neighbourhood with involved residents*. The findings of this study suggest that not all older Surinamese adults require the same neighbourhood resources and that the age-friendly domains are not equally important for their well-being realisation.

A safe neighbourhood in which to stay socially active

Older adults' well-being has been associated with feeling safe and secure in their neighbourhoods [4]. Conversely, the lack of neighbourhood safety is a stressor that reduces well-being [36]. These findings are in line with older Surinamese adults who value *a safe neighbourhood in which to stay socially active* in this study. These participants valued safety and good neighbourhood facilities because they had socially active lives and liked to go out. This observation is in line with findings that older adults in Amsterdam and Parkstad Limburg, the Netherlands, value neighbourhoods that are safe, accessible and enable them to stay active, involved and engaged to realise well-being [37, 38]. Participants spending ample time in their neighbourhoods may also explain the importance that they placed on having good social ties with neighbours. However, the participants emphasised the need for low-key contact with neighbours (e.g. greeting each other but not needing to be in touch everyday) to safeguard their privacy. Privacy in the home has been found to be an important contributor to well-being [39]. These participants also engaged in neighbourhood activities, which has been associated with the availability of social resources, such as support and contacts [40]. Indeed, participants holding this viewpoint indicated that activity attendance contributed to their social and emotional support systems and was critical for receiving information.

A supportive neighbourhood in which to stay independent

Older Surinamese adults who value *a supportive neighbourhood in which to stay independent* reflects the community support and health services domain, presumably because many participants holding it lived alone and had health issues that caused them to focus on health-related aspects. This result supports the finding that older people frequently mention health when defining well-being [41, 42]. Older adults

seem to assess their neighbourhood resources in terms of the extent to which they contribute to a sense of control and autonomy, taking past experiences and future expectations into consideration [43]. The sense of control and autonomy was reduced for participants with this viewpoint, as they could not do everything as they had in the past. They emphasised the importance of suitable housing (e.g. with an elevator) and shops within walking distance, as these resources supported their preservation of independence or minimal dependence (i.e. conferred control and autonomy in their daily activities). Additionally, suitable housing has been shown to contribute to the sense of safety of older adults in the Hague, the Netherlands [44]. Moreover, poorly adapted housing can lead to the institutionalisation of older adults [45]. Older adults seem to be selective about when and from whom they seek support and about the kind of support that they seek [46]. In general, they seek support from family and close friends before seeking it from neighbours [47]; however, our participants with this viewpoint emphasised the importance of neighbours' support, as their family lived far away and such support was more accessible. The exchange of help among neighbours can contribute to the personal support networks that help older adults to cope with everyday life, and ultimately to their well-being [48, 49].

A well-maintained neighbourhood with involved residents

Older Surinamese adults who value *a well-maintained neighbourhood with involved residents* emphasise the importance of well-maintained and safe neighbourhoods and residents' involvement in contributing to these aspects, in part to impact others' perceptions; this perspective reflects a certain degree of neighbourhood attachment. Residents' involvement in neighbourhood maintenance pertains to neighbourhood social structures [50]. Residents with neighbourhood attachment tend to be more passionate about community matters than are other residents, and to more actively maintain and safeguard their communities [51]. Our participants also emphasised the need for the municipality to facilitate neighbourhood maintenance. Consistent with their viewpoint, research shows that successful neighbourhood maintenance requires the engagement of residents and local (e.g. municipal) governmental agencies [52]. These participants also valued being well-informed, including understanding information and knowing where you can find information. They spoke of their challenges in accessing digital information, and proposed that younger people with more digital skills could help them do so. The digital provision of public information has been found to challenge the skills of older adults in the Netherlands; provision in oral and printed forms is essential for this group to receive information [13]. A recent literature review showed that older adults face major challenges in participating in and benefitting from the

digital revolution, which excludes them from society [53]. In addition, tutors seem to be crucial for the overall success of interventions targeting the digital skills of older adults [54]. For example, college students' tutoring of older adults effectively improved the latter's eHealth literacy [55]. The implementation of tutor-based interventions may be a solution for the digital exclusion that older Surinamese adults experience.

Consensus statements

All participants in this study emphasised the importance of living in neighbourhoods where people respect older adults. Although respect is known to be influenced by physical (e.g. inaccessible buildings) and social (e.g. age-targeting stereotypes) neighbourhood characteristics [56], our participants addressed only social aspects related to respect in their neighbourhoods. Additionally, all participants valued living in neighbourhoods where care at home is easy to obtain, albeit for different reasons. Participants who valued a safe neighbourhood in which to stay socially active considered the receipt of care at home to be relatively important with consideration of potential future impairment, whereas those who valued a supportive neighbourhood in which to stay independent and a well-maintained neighbourhood with involved residents did so with consideration of previous and current health impairment and experiences. The receipt of care at home can be important for the well-being of older adults who are vulnerable and in poor health [57] our findings indicate that it is also important for the well-being of older Surinamese adults who are not vulnerable and are in relatively good health.

The international literature shows that migrants' choices of neighbourhoods in which to reside are determined largely by the composition of neighbourhood populations, and specifically the presence of ethnic minorities with the same backgrounds [58]. Findings regarding Surinamese migrants' preferences regarding their residential locations and whether to live near people with the same ethnic background in the Netherlands are inconclusive [59, 60]. This study shows that older Surinamese adults do not prefer to live in neighbourhoods with exclusively Surinamese people. Living among people with the same ethnic background can shelter individuals from discrimination and provide positive social and cultural connections [61, 62]. However, participants in our study highlighted the opportunities provided by mixed neighbourhoods, such as learning about other cultures and sharing food on culturally important occasions.

Limitations

Several limitations need to be considered when interpreting the results of this study. First, we assessed the comprehensibility and unambiguity of the Q-set state-

ments, but during the interviews participants mentioned the feasibility of certain statements (e.g. on affordable housing) with respect to other statements that may have influenced their ranking. Second, the generalisability of our results may be limited, as this study was conducted in the four largest cities in the Netherlands. Thus, further research in other regions and countries is needed to confirm and expand our study findings. Third, it was not feasible to examine all migrant groups in the Netherlands in this study. In a larger study, we focus on several of these migrant populations [20]. In general, facilities in the Netherlands are clustered in neighbourhood units that are functionally ordered across cities [63]; the replication of this study in other countries with different neighbourhood structures may yield different findings.

CONCLUSION

This study revealed three distinct viewpoints on aspects that older Surinamese adults in the Netherlands find to be important for neighbourhood age-friendliness and their well-being realisation: a safe neighbourhood in which to stay socially active, a supportive neighbourhood in which to stay independent and a well-maintained neighbourhood with involved residents. Thus, not all older Surinamese adults in the Netherlands need the same neighbourhood resources, and not all neighbourhood resources are equally important for this population's well-being.

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APPENDIX

Table 1. Descriptive statistics for the factors

	Factor 1[a] ***n*** **= 13**	**Factor 2[b]** ***n*** **= 6**	**Factor 3[c]** ***n*** **= 5**
	Number or mean (SD)		
Age (years)	75.38 (5.61) (68 – 84)	77.33 (8.24) (65 – 88)	73.80 (5.93) (68 – 82)
Gender			
- Female	8	3	2
- Male	5	3	3
Education			
- Low	3	1	2
- High	10	5	3
Living situation			
- Alone	9	4	2
- With partner	4	2	3
City			
- Amsterdam	6	1	2
- Rotterdam	3	2	2
- The Hague	1	2	2
- Utrecht	3	1	0
Ethnic background			
- Surinamese Chinese	2	0	1
- Surinamese Creole	1	5	1
- Surinamese Javanese	1	1	0
- Surinamese Hindustani	8	0	2
- Mixed	1 (Surinamese Creole and Surinamese Javanese)	0	1 (Surinamese Chinese and Surinamese Javanese)
Walking difficulties	4	4	0
Poor balance	5	2	0
Visually impaired	2	2	1
Chronic condition			
- Diabetes mellitus II	3	0	1
- Cardiovascular diseases	2	1	0
- Lung diseases	4	0	2
- Joint wear	7	2	2
- Osteoporosis	2	1	0
- Chronic joint inflammation	4	0	1

- Other	1 (hearing impaired)	0	0
Chronic disease	10	2	3
Multimorbidity	8	2	1
Overall well-being	3.22 (.51)	2.85 (.86)	3.12 (.15)
Physical well-being	3.12 (.69)	3.06 (.74)	3.37 (.30)
Social well-being	3.26 (.49)	2.93 (1.00)	2.96 (.13)

[a] = A safe neighbourhood in which to stay socially active, [b] = A supportive neighbourhood in which to stay independent, [c]= A well-maintained neighbourhood with involved residents.

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7 General discussion

GENERAL DISCUSSION

The main objective of this dissertation is to examine the importance of neighbourhood age-friendliness in the promotion of health behaviours and the optimization of well-being among older Surinamese migrants in the Netherlands. We expect that insights into these relationships will facilitate the development of policy to promote health behaviours and well-being among older Surinamese adults in the Netherlands and provide directions for future research. The research aims of this study were stated as follows:

1. To identify promising neighbourhood interventions to promote the health and well-being of older migrants.
2. To identify the relationship between neighbourhood age-friendliness and physical activity among older Surinamese adults.
3. To identify the relationship between health behaviours and the well-being of older Surinamese adults.
4. To identify how older Surinamese adults experience the age-friendliness of their neighbourhood and how they realize well-being.

In this chapter, the main findings of the research conducted for this dissertation are discussed. Furthermore, theoretical and methodological reflections, and the implications of the research for practice and future research are discussed.

Main research findings

Research aim 1: To identify promising neighbourhood interventions to promote the health and well-being of older migrants.

The research conducted to achieve this aim involved a systematic review of the effectiveness of neighbourhood interventions to promote the health and/or well-being of older migrants. The majority (89%) of the included studies demonstrated efficacy in the attainment of at least one health and/or well-being outcome. Thus, Chapter 2 shows that neighbourhood interventions can improve the health and/or well-being of older migrants. These interventions can either be small (e.g. establishing a walking group in the community to enhance physical activity) or large-scale (e.g. improving street connectivity to stimulate mobility, safety, and social connections in the neighbourhood) [48]. These insights can be used to develop neighbourhood interventions to enhance older migrants' health and well-being.

Chapter 2 reveals that 22 interventions (out of a total of 39) used a culturally sensitive approach and were effective in promoting health and/or well-being. However, the majority of these studies only took the native language of the participants into account. This is an important first step (involving bilingual facilitators or

providing materials to participants in their native language is known to enhance the effectiveness of interventions targeting healthy behaviours [1]), but still rather small in terms of a culturally sensitive approach. The consideration of additional methods such as the use of culturally sensitive pictures and socially and culturally specific examples would be worthwhile [2-5]. Only nine of the 22 culturally sensitive interventions included in the systematic review used this combined approach. These interventions not only translated information into the native language of the participants, but also tailored their examples and pictures to the targeted culture. Although this approach seems rather small, it emphasizes the importance of developing interventions which combine various culturally sensitive strategies to promote older migrants' health and well-being. Culturally sensitive interventions for migrant populations do not need to be developed de novo; existing effective interventions can be adapted to the older migrant population. Davidson and colleagues (2013) developed RESET (Relevance, Evidence base, Stages of intervention, Ethnicity, and Trends), a decision-making tool which can assist researchers in selecting adaptations to employ and in determining when to develop culturally sensitive interventions [6]. The adaptation of existing interventions to improve their suitability for a culturally diverse group tends to be more effective and better accepted by the target population [7-10]. Indeed, el Fakiri and colleagues adapted the *Zicht op Evenwicht* (View of Balance) intervention to align it to the older migrant population in the Netherlands. The intervention aimed to reduce the fear of falling among older participants. To align the intervention with the older migrant population, adaptations were made in the content of the intervention, visual material that better matched the experience of the older migrant population was applied, and shorter and less complex sentences were used in the PowerPoint presentations [11]. The effect evaluation showed that participants experienced less fear of falling during the performance of various activities, more self-confidence, and reduced social loneliness. Neighbourhood interventions targeting the migrant population can benefit from such an approach. These measures would vastly improve the cultural sensitivity of interventions, which would be expected to produce better outcomes.

Research aim 2: To identify the relationship between neighbourhood age-friendliness and physical activity among older Surinamese adults.

The study described in Chapter 3 provided insight into cross-sectional associations of neighbourhood age-friendliness and physical activity among older Surinamese adults. Multilevel analysis disclosed that the neighbourhood level significantly affected physical activity among older Surinamese adults, indicating that neighbourhoods differ in the impacts of neighbourhood age-friendliness on physical activity.

As in the general older population [12, 13], positive relationships between age-friendly neighbourhood resources with physical activity among older Surinamese adults were identified in this study. Specifically, *outdoor spaces and buildings*, *communication and information*, *community support and health services*, and *respect and social inclusion* correlated with physical activity. Thus, age-friendly neighbourhood resources are expected to increase this population's physical activity level.

Neighbourhood resources such as street connectivity, sidewalks, and the availability of green spaces have promoted physical activities, especially walking, among older adults [14]. Inhabitants of neighbourhoods that support a physically active lifestyle (e.g. walkable environments, destinations for walking) are more likely to maintain residence at home than their counterparts [15]. Thus, ageing in place can be promoted by local neighbourhood resources conducive to physical activity. The development of neighbourhoods that support physical activity near homes may enable older adults to maintain a balance between their functional abilities and living environments, thereby adding more years of ageing in place.

Adherence to lifestyle advice (such as maintaining physical activity) that is inconsistent with one's culture may be challenging for Surinamese people [16]. *Communication* which takes migrants' culture, language and literacy into account seems essential to promote a healthy lifestyle [17]. Peer educators seem to be effective in *informing* migrants to promote healthy behaviour [18]. In addition to linguistic benefits for those who do not speak the host nation's language, information for and by migrants carries the advantage that the culture of the target population and the information provider correspond, which may strengthen the information message [19]. In addition, the use of ethnically specific channels (e.g. temples, key persons) seems essential to reach older migrants in the Netherlands and thereby promote interventions [20-22].

Chapter 3 showed that *community support and health services* are positively associated with physical activity among older Surinamese migrants. According to an inventory report of *Mulier Instituut*, coordination between various parties (e.g. policy makers, sports facilities) regarding the promotion of physical activity among older adults is absent at both national and regional levels in the Netherlands [23]. More cooperation and coordination are desirable, so that knowledge and financial resources can be applied efficiently to promote physical activity among the older migrant population.

In the Netherlands, people with a migration background and older adults are less likely to be physically active [24]. In 2022, the Ministry of Health, Welfare and Sport acknowledged that more attention is needed to promote a healthy lifestyle, including physical activity, through the physical living environment [25]. This study showed that in addition to physical neighbourhood resources such as *outdoor*

spaces and buildings, communication and information, and *community support and health services,* neighbourhood social resources such as *respect and social inclusion* impact the physical activity of older Surinamese. This finding emphasizes the importance of addressing neighbourhood social resources in policy development to promote physical activity. For example, social inclusion (e.g. sense of community) promotes walking [26].

Chapter 3 indicated that there was no association between the domains *housing, transportation, social participation,* and *civic participation and employment* with physical activity among older Surinamese migrants. From an international perspective, *housing* options in the Netherlands are of high quality [27]. Additionally, in the Netherlands, home modification options are encouraged to support older adults and enable them to live at home for as long as possible. Thus, participants' homes may already have supported their capabilities, which may explain the lack of association between housing and physical activity. In contrast to previous research that found a positive association between *public transport* and physical activity [28], the findings of Chapter 3 showed no significant association. Customer satisfaction with public transport in the Netherlands is high [29]; this might explain why the study in Chapter 3 did not find a significant association between public transport and physical activity. Based on the results of Chapter 3, *social participation* and *civic participation and employment* seemed less relevant concerning physical activity for older Surinamese adults. In general, social and civic participation seems low among the older Surinamese population [30], which may explain the lack of association between these domains and physical activity within this community.

Research aim 3: To identify the relationship between health behaviours and the well-being of older Surinamese adults.

The research conducted to fulfil this aim provided insight into cross-sectional associations of health behaviours (healthy diet, physical activity, no smoking, social activity) with older Surinamese adults' well-being. Chapter 4 showed positive relationships between *fruit and vegetable intake, physical activity,* and *often visiting family/friends* with the well-being of older Surinamese adults, which also has been demonstrated in other population groups [31-33]. Thus, healthy behaviours are expected to benefit older Surinamese adults' well-being. Furthermore, social activity should be included as an important health behaviour to promote well-being among older Surinamese adults in addition to the more traditional health behaviours (healthy diet, physical activity, no smoking).

Worldwide, national governments and municipalities focus on prevention to promote health and well-being. The findings in Chapter 4 disclose that health

behaviours (healthy diet, physical activity, and social activity) can be used in a prevention strategy to promote older Surinamese adults' well-being. Socio-economic health inequalities continue to increase in the Netherlands. This dissertation shows that prevention strategies aimed at promoting healthy behaviours may enhance health and well-being among older Surinamese effectively, and may subsequently lead to lower health care costs [34, 35]. As shown in Chapter 2, the consideration of culturally sensitive strategies is essential in the design of preventive interventions for older migrants.

Research aim 4: To identify how older Surinamese adults experience the age-friendliness of their neighbourhood and how they realize well-being.

In order to create age-friendly neighbourhoods to thereby enhance the well-being of a diverse group of older adults, experiences and the relative importance of neighbourhood age-friendliness must be explored. Chapter 5 describes the experience of older Surinamese adults with neighbourhood age-friendliness, in general and during the COVID-19 pandemic. Neighbourhood age-friendliness was essential for the community engagement of older Surinamese adults and for the provision of social support. Participants indicated that certain neighbourhood resources enabled them to overcome the negative experiences of the pandemic. However, neighbourhood age-friendliness differed within and across neighbourhoods. For example, with the implementation of pandemic-related measures to maintain physical distance, benches were made unavailable. Participants indicated that this discouraged them from going for walks, because they had nowhere to rest. Neighbourhood changes that deterred physical activity among older Surinamese adults were not made in all neighbourhoods, revealing differences in the extent to which neighbourhoods supported older (Surinamese) adults' opportunities to venture outdoors and engage in active lifestyles during the pandemic. Indeed, older adults in the Netherlands were less physically active than before the pandemic [36]. This finding highlights the benefit that a simple neighbourhood resource such as a bench can bring to the lifestyle of older (Surinamese) adults, which can subsequently impact their health and well-being. As older Surinamese adults in the Netherlands have been disproportionately affected by the COVID-19 pandemic, the ability to provide support in response to older adults' needs contributes to their neighbourhood age-friendliness and may be especially important during public health emergencies [37].

Older Surinamese participants emphasized the importance of maintaining a connection with their culture, which was evident in their perceptions and experiences of neighbourhood age-friendliness. For example, participants reported that having a Surinamese toko in the neighbourhood where they could purchase

traditional herbs and vegetables contributed to an age-friendly neighbourhood. Congruent with previous research, this dissertation shows that culture is an essential consideration during the development of age-friendly neighbourhoods in response to the needs of a diverse group of older people [38-40].

Previous research has indicated that neighbourhood age-friendliness is essential to realize well-being; however, the relative importance of neighbourhood age-friendliness may vary among older Surinamese adults. The findings reported in Chapter 6 show that not all older Surinamese adults require the same neighbourhood resources for their well-being. Three distinct viewpoints in which various neighbourhood aspects were considered important were extracted: 1) *a safe neighbourhood in which to stay socially active,* 2) *a supportive neighbourhood in which to stay independent* and 3) *a well-maintained neighbourhood with involved residents*.

In contrast to older Surinamese with other viewpoints, participants holding the viewpoint *a safe neighbourhood in which to stay socially active* are independent, socially active, and like to go out. In doing so, participants value a neighbourhood in which local facilities such as public transportation, shops, and meeting places for older adults are well arranged. Also, participants emphasized the importance of feeling safe in the neighbourhood. Preference for neighbourhood safety and being active in the neighbourhood might be linked, as older adults who perceive their neighbourhood as safe are more likely to be active compared to those who regard their neighbourhood as unsafe [41].

Unlike older Surinamese adults with other viewpoints, participants who valued *a supportive neighbourhood in which to stay independent* highly appreciate the domain community support and health services; most of these participants have health limitations, live alone, and depend a great deal on formal and informal care and support. They value a neighbourhood which supports their ability to live independently at home despite their physical limitations. Social cohesion and social capital among neighbours may lead to higher levels of well-being among older adults, as they result in higher degrees of social organisation, including the provision of support [42]. Indeed, participants who value *a supportive neighbourhood in which to stay independent* appreciate strong social ties with their immediate neighbours who were crucial in providing support. Next to enhancing participants' well-being realisation, informal care is expected to reduce burdens on the healthcare system by preventing or delaying nursing home admissions [43]. Older Surinamese adults who valued *a supportive neighbourhood in which to stay independent* also indicated that volunteers could support their ability to continue living at home; however, the facilitation of collaboration among neighbours, volunteers and professional support-givers is challenging [44, 45]. Additionally, such collaboration may increase health inequities within and between neighbourhoods, but do

not necessarily increase equity of access to neighbourhood services among groups of older migrants in the Netherlands [46-49]. Consistent with previous research among frail older adults in the Netherlands, participants who valued *a supportive neighbourhood in which to stay independent* emphasized the importance of having neighbourhood resources (e.g. general practitioners and pharmacies, shops within walking distance) to maintain their independence [50]. 'Independence' may have different connotations for different populations; thus, building neighbourhoods that support older adults' ability to maintain independent living requires recognition of the interplay between needs and physical and social conditions.

Older Surinamese participants who valued *a well-maintained neighbourhood with involved residents* appreciated a neighbourhood which was clean and well-maintained as it gave them and others positive outlooks. Participants also indicated that neighbourhood safety contributed to their well-being. These findings are consistent with previous research which showed that the more litter and degeneration that older people perceive and experience in the neighbourhood, the more they feel unsafe [51]. Older Surinamese adults holding this viewpoint stressed the importance of residents' involvement in achieving a well-maintained and safe neighbourhood. However, they indicated the need for the municipality to facilitate neighbourhood maintenance and safety. Consistent with this viewpoint, previous research indicated that successful neighbourhood maintenance requires the engagement of residents and local governmental agencies [52].

Theoretical reflection

For this dissertation, the World Health Organization's (WHO) guide for age-friendly cities was utilized to investigate neighbourhood age-friendliness, health behaviours, and well-being. The framework enabled the involvement of a wide range of important physical and social neighbourhood resources. The framework is based on comprehensive research and takes a broad perspective on physical and social neighbourhood resources; thus, it provides a strong bottom-up empirical foundation of research on essential neighbourhood resources. The WHO age-friendly cities framework is a guide for a city's self-assessment and can be used to evaluate progress. However, it does not offer a strong theoretical foundation. Therefore, we incorporated important theoretical concepts of the ageing in place literature to investigate neighbourhood age-friendliness among older Surinamese migrants in the Dutch context and to strengthen the theoretical foundation. Effective interventions are rooted in robust theoretical foundations. While this study provides an important step to improve health and well-being among older Surinamese migrants in the Netherlands, larger-scale research is needed. Our understanding of why certain neighbourhoods are more age-friendly than others, and how such age-friendly

communities relate to the well-being of older people, particularly older migrants, remains limited. Using the WHO guide for age-friendly cities gave some direction but lacked a strong theoretical foundation as it adopted a bottom-up approach, resulting in a somewhat idiosyncratic compilation of neighbourhood resources. Furthermore, even if we were aware of relevant neighbourhood resources, validated instruments to assess these resources and the age-friendliness of communities for migrant populations (e.g. among older people in the Netherlands with a Turkish or Moroccan migration background, which are the largest migrant populations in the Netherlands) are lacking. Theory on community age-friendliness among older native Dutch and migrant individuals, as well as the extent to which age-friendliness contributes to their well-being, are still largely unknown, and will be addressed in large-scale follow-up research [53].

Methodological reflection

While this dissertation provided important insight into the importance of culturally sensitive (neighbourhood) interventions to promote health and well-being among older Surinamese adults in the Netherlands, we did not develop and evaluate such an intervention. The initial idea was to develop a culturally sensitive neighbourhood intervention, in collaboration with the municipality of Rotterdam and older Surinamese adults to promote their health and/or well-being. However, due to the COVID-19 pandemic and its consequent restrictions, the development of a culturally sensitive neighbourhood intervention to promote older Surinamese migrants' health and/or well-being was not feasible. Alternatively, we conducted a Q-study (Chapter 6) to examine the relative importance of neighbourhood resources to realize well-being. This study gave us relevant insights to promote more inclusive policies for migrants to grow old in their own neighbourhoods that meet the demands of a diverse group of older adults. Furthermore, the findings of Chapters 2, 3, 4, and 5 also provide valuable new insights for the development of culturally sensitive neighbourhood interventions.

In this dissertation, we relied on self-reported measures to examine older Surinamese adults' neighbourhood age-friendliness, health behaviours, and well-being. Self-reported and objective neighbourhood measures may be distinct (e.g. perceiving the neighbourhood to be less walkable than it objectively is); this discrepancy seems more common among older adults compared to younger people [54-56]. The consideration of both perceived and objective neighbourhood measures can improve our understanding of the associations of neighbourhood age-friendliness, health behaviours, and well-being.

This dissertation utilized a mixed-methods design that featured the combined analysis of quantitative and qualitative data. Multiple research methods were

used to investigate the importance of neighbourhood resources in the promotion of health behaviours and the optimization of well-being. The systematic review provided us insight into promising neighbourhood interventions to promote older migrants' health and/or well-being. The survey study provided us with an understanding of the relationship between neighbourhood resources and physical activity among older Surinamese adults. It also provided us insight into the relationship between their health behaviours and well-being. Next, the interviews provided insight into older Surinamese adults' experiences with the age-friendliness of their neighbourhoods in general and during the COVID-19 pandemic. Finally, the use of Q-methodology allowed us to explore participants' views on neighbourhood resources for their well-being realisation. The combined use of multiple research methods is a considerable strength of this dissertation, as it enables the development of a more thorough understanding of older Surinamese adults' needs for neighbourhood resources to optimize/maintain their well-being.

Implications for practice

The findings presented in this dissertation show that investment in age-friendly neighbourhoods id valuable for older Surinamese adults' health and well-being realization. Compared to the native Dutch older population, older Surinamese adults have poorer health and are more likely to suffer from chronic diseases [57-60] and psychological distress [61]. Engaging in a healthy lifestyle is well known to benefit health and well-being. This dissertation shows that neighbourhood resources play a significant role in older Surinamese adults' health behaviour and their well-being realization. Furthermore, it provides insight into facilitators and barriers in older Surinamese adults' experiences with the age-friendliness of their neighbourhood and their well-being realisation. This dissertation provides guidance for policymakers regarding steps that are necessary to facilitate the development of age-friendly neighbourhoods.

Developing age-friendly neighbourhoods for a diverse group of older adults becomes increasingly important with the establishment of governmental policies aiming at independent living in the community for as long as possible. This dissertation confirmed that neighbourhood age-friendliness impacts the health and well-being of older Surinamese adults. Participants indicated that staying in touch with their culture was essential, which they reflected in their experiences with and perceptions of neighbourhood age-friendliness. For example, the availabilities of Surinamese tokos, Surinamese group living facilities, and Surinamese activities in the neighbourhood were indicated to enhance participants' well-being, and contributed to their sense of neighbourhood age-friendliness. Thus, the development

of age-friendly neighbourhoods for a diverse group of older adults must consider their cultural norms and values regarding their neighbourhood resources.

This dissertation implies that the social element (e.g. contact with neighbours, familiar faces in local shops, neighbourhood activities) of the neighbourhood is essential for older Surinamese people in their perception of an age-friendly neighbourhood. Social neighbourhood resources emerged in the different domains of an age-friendly neighbourhood, which illustrates the overlap of the different domains. Focusing on the social elements in the neighbourhood can contribute positively to the attainment of the goal of the Dutch government to enable older adults to live at home for as long as possible. This research shows, for example, that strong social contacts between neighbours provide access to support, and promote feelings of being more informed about the neighbourhood and belonging to the community. Additionally, social neighbourhood resources were indicated to improve physical activity. Investing in local social contact of older Surinamese adults might be especially important for this population, as they are more likely to live without a partner or children compared to the elders of other migrant and native Dutch populations [30], which may impact their self-reliance.

During the COVID-19 pandemic, the primary focus of the Dutch government was to reduce viral transmission; social distancing was the foremost measure. This dissertation shows that social distancing had a huge negative impact on the well-being of older Surinamese adults. Social distancing rules confounded physically and socially active lifestyles. This dissertation shows that older Surinamese adults require support to enable them to cope with the loss of purposeful activities during a pandemic and to remain engaged in community life. Additionally, participants indicated that places in which to socialize (e.g. parks, libraries, benches) contribute to their feeling of inclusion and provide opportunities to be physically and socially active. This dissertation shows the importance of the availability of meeting places, in general and during a pandemic, as it has a profound impact on the physical and social life of older Surinamese adults and their subsequent health and well-being.

Recommendations for future research

We used a mixed method design to gain insight into the importance of neighbourhood age-friendliness in the promotion of health behaviours and the optimization of well-being among older Surinamese migrants in the Netherlands. Based on the findings reported in this dissertation, several recommendations for future research can be given.

First, future research should invest in the development of culturally sensitive neighbourhood interventions to promote older Surinamese migrants' health and/

or well-being. This dissertation showed a positive association between healthy behaviours and the well-being of older Surinamese. Thus, we recommend the exploration of how neighbourhood interventions targeting older Surinamese adults' health behaviours contribute to their well-being.

Second, this dissertation shows that age-friendly neighbourhoods impact the healthy behaviour and well-being of older Surinamese. It provides insight into their experiences and preferences regarding neighbourhood resources concerning age-friendliness. For further research, we recommend the examination of how neighbourhood resources impact the health and well-being of older Surinamese migrants.

Third, we focused on older Surinamese adults, which is the first step in developing age-friendly neighbourhoods in the Netherlands for this particular migrant group. Research among other migrant groups in the Netherlands, such as Moroccan and Turkish migrant populations, which are the other large migrant groups in the Netherlands, is recommended. This will contribute to the development of inclusive age-friendly neighbourhoods in the Netherlands. Large-scale studies which have strong theoretical underpinning are suggested.

Conclusions

The main objective of this dissertation was to examine the importance of neighbourhood age-friendliness in the promotion of health behaviours and the optimization of well-being among older Surinamese migrants in the Netherlands. The research reported in this dissertation provides new perspectives on neighbourhood age-friendliness, health behaviour, and well-being among the older Surinamese population. It expands on the existing literature by giving insight into 1) promising neighbourhood interventions to promote the health and/or well-being of older migrants, 2) the relationship between neighbourhood age-friendliness and physical activity, 3) the relationship between health behaviours and well-being, and 4) the views of older Surinamese adults in the Netherlands on neighbourhood age-friendliness and well-being realization. This dissertation highlights the value of investing in neighbourhood age-friendliness to benefit the health and well-being of older Surinamese migrants. For future research, we recommended culturally sensitive approaches to target the health and/or well-being of older Surinamese migrants.

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Appendix

SUMMARY

Currently, Dutch neighbourhoods do not meet the demands of a culturally diverse older population. Multicultural cities in the Netherlands have diverse societies with distinctive needs and preferences regarding ageing in place. In order to understand neighbourhood age-friendliness and promote health behaviours and well-being effectively, it is essential to consider the influence of different cultures. The main objective of this dissertation is to examine the importance of neighbourhood age-friendliness to promote health behaviours and optimize well-being among older Surinamese migrants in the Netherlands.

Whether neighbourhood interventions improve older migrants' health and/or well-being is not clear. The research described in Chapter 2 involves a systematic review reporting on 39 interventions aiming at older migrants' health behaviour to promote their health and/or well-being. The systematic review indicated that the neighbourhood is a significant place to implement interventions to promote older migrants' health and/or well-being. However, there is a lack of culturally sensitive interventions to enhance older migrants' health and/or well-being.

Neighbourhood age-friendliness is expected to promote physical activity, but the relationship among older Surinamese adults remains unclear. The research in Chapter 3 described the results of a cross-sectional survey among 697 older Surinamese adults living in Rotterdam, the Netherlands. Correlation and multilevel analysis were performed to examine the relationship between neighbourhood age-friendliness and physical activity among older Surinamese adults. The results showed a significant relationship between the domains outdoor spaces and buildings, communication and information, community support and health services, and respect and social inclusion with physical activity. The multilevel analysis further confirmed that overall neighbourhood age-friendliness was positively associated with physical activity.

Chapter 4 presented research examining the relationship between health behaviours (healthy diet, physical activity, not smoking and social activity) with well-being among older Surinamese adults. Over half of the participants met the Dutch guidelines for fruit and vegetable intake, but less than half met the guidelines for fish intake and physical activity. The majority of the participants were nonsmokers and had regular contact with family and/or friends. The multiple regression analyses indicated that eating enough fruits and vegetables, engaging in physical activity, and frequently visiting family and/or friends were positively associated with well-being among older Surinamese individuals.

In order to identify how older Surinamese adults experienced the age-friendliness of their neighbourhood in general and during the COVID-19 pandemic, in-

depth interviews were conducted. Chapter 5 described older Surinamese adults' experiences and preferences regarding neighbourhood age-friendliness in general and during the COVID-19 pandemic. In total 17 older Surinamese adults living in Rotterdam and the Hague were interviewed on their views on neighbourhood age-friendliness and their experiences with it. Older Surinamese adults shared their perspectives on how certain neighbourhood resources either enhanced or hindered the age-friendliness of their neighbourhood. During the COVID-19 pandemic, the participants experienced changes in their priorities and perceptions of neighbourhood age-friendliness. The study found that overall, older Surinamese adults considered age-friendly neighbourhoods to be crucial for community engagement and receiving social support, especially during the pandemic.

Chapter 6 describes a Q-methodology, which combines quantitative and qualitative analysis, to explore the relative importance of neighbourhood resources to realize well-being among older Surinamese adults. The analyses revealed three factors representing three distinct viewpoints of older Surinamese adults on the importance of neighbourhood resources to realize well-being. Older Surinamese adults holding viewpoint 1 value a safe neighbourhood in which to stay socially active. Participants prioritize having good neighbourly relationships, as it fosters a sense of safety and minimizes disturbance. Participants emphasized the significance of the good organization of neighbourhood facilities, such as public transport and neighbourhood activities, as it supported them to be socially active. Older Surinamese adults holding viewpoint 2 valued a supportive neighbourhood in which to stay independent. As many of these participants faced health limitations and lived alone, they relied heavily on formal and informal care and support. The most defining age-friendly domain for this viewpoint was community support and health services. Participants emphasized the importance of having suitable housing for older adults and having shops and activities within walking distance. These facilities were crucial in enabling them to maintain their independence at home despite their physical limitations. Older Surinamese adults holding viewpoint 3 value a well-maintained neighbourhood with involved residents. These participants emphasized the significance of their neighbourhood's appearance and safety, while also stressing the collective responsibility of residents in maintaining these aspects.

Chapter 7 provides a discussion of the main findings of this dissertation. Additionally, it reflects upon the theory and methodology. Implications for practice such as, consideration of culture to develop age-friendly neighbourhoods are described. Furthermore, recommendations for future research such as the development of a culturally sensitive neighbourhood intervention to promote older Surinamese migrants' health and/or well-being are described.

This dissertation shows the importance of neighbourhood age-friendliness to promote health behaviours and optimize well-being among older Surinamese migrants in the Netherlands. Neighbourhood resources seem to have a significant impact on older Surinamese adults' health behaviours and well-being. This dissertation provided new perspectives on neighbourhood age-friendliness and its relationship with health behaviours and well-being among Surinamese adults.

SAMENVATTING

Momenteel voldoen Nederlandse buurten niet aan de eisen van een cultureel diverse oudere bevolking. Multiculturele steden in Nederland hebben onderscheidende samenlevingen met verschillende behoeften en voorkeuren met betrekking tot het ouder worden in de eigen buurt. Om leeftijdsvriendelijke buurten voor ouderen te begrijpen en effectief gezond gedrag en welzijn te bevorderen, is het essentieel om rekening te houden met de invloed van verschillende culturen. Het hoofddoel van dit proefschrift is om het belang van leeftijdsvriendelijke buurten te onderzoeken om gezond gedrag te bevorderen en welzijn te optimaliseren bij oudere Surinaamse migranten in Nederland.

Het is niet duidelijk of buurtinterventies de gezondheid en/of het welzijn van oudere migranten verbeteren. Het onderzoek beschreven in Hoofdstuk 2 omvat een systematische review van 39 interventies gericht op gezond gedrag van oudere migranten om hun gezondheid en/of welzijn te bevorderen. De systematische review gaf aan dat de buurt een belangrijke plek is om interventies te implementeren om de gezondheid en/of het welzijn van oudere migranten te bevorderen. Er ontbreken echter cultuur sensitieve interventies om de gezondheid en/of het welzijn van oudere migranten te verbeteren.

Verwacht wordt dat leeftijdsvriendelijke buurten de fysieke activiteit bevordert, echter is de relatie onder Surinaamse ouderen nog onduidelijk. Het onderzoek in Hoofdstuk 3 beschrijft de resultaten van een cross-sectioneel onderzoek onder 697 Surinaamse ouderen die in Rotterdam wonen. Correlatie- en multilevel-analyses werden uitgevoerd om de relatie tussen leeftijdsvriendelijke buurten en fysieke activiteit onder Surinaamse ouderen te onderzoeken. De resultaten toonden een significante relatie aan tussen de domeinen *buitenruimtes en gebouwen, communicatie en informatie, gemeenschapsondersteuning en gezondheidsdiensten,* en *respect en sociale inclusie* met fysieke activiteit. De multilevel-analyse bevestigde verder dat de mate waarin sprake was van algehele leeftijdsvriendelijke buurten positief geassocieerd was met fysieke activiteit.

Hoofdstuk 4 presenteerde onderzoek naar de relatie tussen gezond gedrag (*gezond dieet, fysieke activiteit, niet roken* en *sociale activiteit*) en welzijn onder Surinaamse ouderen. Meer dan de helft van de deelnemers voldeed aan de Nederlandse richtlijnen voor fruit- en groente-inname, maar minder dan de helft voldeed aan de richtlijnen voor visinname en fysieke activiteit. De meerderheid van de deelnemers waren niet-rokers en hadden regelmatig contact met familie en/of vrienden. De multiple regressie-analyses toonden aan dat *voldoende fruit en groenten inname,* deelnemen aan *fysieke activiteit* en *regelmatig familie en/of vrienden bezoeken* positief geassocieerd waren met het welzijn onder Surinaamse ouderen.

Om te identificeren hoe Surinaamse ouderen de leeftijdsvriendelijkheid van hun buurt in het algemeen en tijdens de COVID-19-pandemie ervaarden, werden diepte-interviews gehouden. Hoofdstuk 5 beschreef de ervaringen en voorkeuren van Surinaamse ouderen met betrekking tot leeftijdsvriendelijke buurten in het algemeen en tijdens de COVID-19-pandemie. In totaal werden 17 Surinaamse ouderen die in Rotterdam en Den Haag wonen, geïnterviewd over hun mening over leeftijdsvriendelijke buurten en hun ervaringen daarmee. Surinaamse ouderen deelden hun perspectieven over hoe bepaalde buurtbronnen de vriendelijkheid van hun buurt verbeterden of belemmerden. Tijdens de COVID-19-pandemie ervaarden de deelnemers veranderingen in hun prioriteiten en percepties van buurtvriendelijkheid. Het onderzoek toonde aan dat Surinaamse ouderen leeftijdsvriendelijke buurten als cruciaal beschouwen voor betrokkenheid bij de gemeenschap en het ontvangen van sociale steun, vooral tijdens de pandemie.

Hoofdstuk 6 beschrijft een Q-studie, een methodologie die kwantitatieve en kwalitatieve analyse combineert, om de relatieve belangrijkheid van buurtbronnen voor het welzijn van Surinaamse ouderen te onderzoeken. De analyses onthulden drie factoren die drie verschillende standpunten van Surinaamse ouderen vertegenwoordigen over het belang van buurtbronnen om welzijn te realiseren. Surinaamse ouderen met standpunt 1 hechten waarde aan *een veilige buurt om sociaal actief te blijven*. Deelnemers geven prioriteit aan goede buurrelaties, omdat dit een gevoel van veiligheid bevordert en verstoring minimaliseert. Deelnemers benadrukten het belang van een goede organisatie van buurtfaciliteiten, zoals openbaar vervoer en buurtactiviteiten, omdat dit hen ondersteunde om sociaal actief te zijn. Surinaamse ouderen met standpunt 2 hechtten waarde aan *een ondersteunende buurt om onafhankelijk te blijven*. Omdat veel van deze deelnemers met gezondheidsbeperkingen te maken hadden en alleen woonden, waren ze sterk afhankelijk van formele en informele zorg en ondersteuning. Het meest bepalende leeftijdsvriendelijke domein voor dit standpunt was gemeenschapsondersteuning en gezondheidsdiensten. Deelnemers benadrukten het belang van geschikte woningen voor ouderen en het hebben van winkels en activiteiten op loopafstand. Deze voorzieningen waren cruciaal om hun zelfstandigheid thuis te behouden ondanks hun fysieke beperkingen. Surinaamse ouderen met standpunt 3 hechtten waarde aan *een goed onderhouden buurt met betrokken bewoners*. Deze deelnemers benadrukten het belang van het uiterlijk en de veiligheid van hun buurt, waarbij ze ook het collectieve verantwoordelijkheidsgevoel van bewoners benadrukten in het behouden van deze aspecten.

Hoofdstuk 7 biedt een discussie van de belangrijkste bevindingen van dit proefschrift. Daarnaast reflecteert het op de theorie en methodologie. Er worden aanbevelingen voor de praktijk beschreven, zoals het overwegen van cultuur om

leeftijdsvriendelijke buurten te ontwikkelen. Verder worden aanbevelingen voor toekomstig onderzoek beschreven, zoals de ontwikkeling van cultuur sensitieve buurtinterventies om de gezondheid en/of het welzijn van oudere Surinaamse migranten te bevorderen.

Dit proefschrift toont het belang van leeftijdsvriendelijke buurten om gezond gedrag te bevorderen en welzijn te optimaliseren onder oudere Surinaamse migranten in Nederland. Buurtbronnen lijken een aanzienlijke invloed te hebben op het gezond gedrag en welzijn van Surinaamse ouderen. Dit proefschrift biedt nieuwe perspectieven op leeftijdsvriendelijke buurten en de relatie met gezond gedrag en welzijn onder Surinaamse ouderen.

DANKWOORD

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Presentation at European University of Post-Industrial Cities' Virtual Meeting Platform: Are neighbourhoods age-friendly? Experiences of older Surinamese adults during the COVID-19 pandemic	2022
Presentation at 15th Global Conference on Ageing: The essential role of age-friendly neighbourhoods during a pandemic: A study conducted with older Surinamese adults in the Netherlands during the COVID-19 crisis	2021
Interview at Sunrise Radio: Neighbourhood age-friendliness among older migrants	2021
Interview at Stanvaste Radio: Neighbourhood age-friendliness among older migrants	2020

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Group dynamics	2022
Q-methodology	2021
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How to supervise students	2021
Self-presentation: focus, structure, interaction and visualisation	2020
Qualitative interview techniques	2020
English academic writing	2020
Nature nurture	2020
Intervision in education	2020
Searching, finding and managing your literature	2019
Basis didactics	2019
Qualitative coding with ATLAS.ti	2019
Brush up your SPSS skills 2019	2019
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About the author

Warsha Jagroep studied Health and Life Sciences (with a specialization in Biomedical Sciences and minor 5 Big issues in Health) at the Vrije Universiteit in Amsterdam. She continued her education at Leiden University and obtained a masters's degree in Vitality and Ageing in 2018. She also holds a degree in nursing and has provided care to older adults with somatic and psychogeriatric diseases. After graduation, Warsha started her PhD trajectory at the Erasmus School of Health Policy and Management at the department of socio-medical sciences. She conducted research about neighbourhood age-friendliness and the heath behaviours and well-being of older Surinamese adults in the Netherlands, which resulted in this dissertation. The results of her research were published in international peer-reviewed journals and presented at national and international conferences. Next to conducting research, she taught various courses such as 'Ziekte en Gezondheid' and 'Zorg en Welzijn', and supervised bachelor theses.