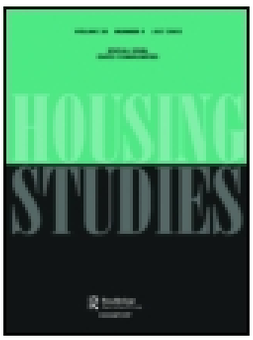

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Collective self-build for senior friendly communities. Studying the effects on social cohesion, social satisfaction and loneliness

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ABSTRACT

Neighbourhood social cohesion is important for the health and well-being of the ageing population. It is therefore crucial to study how we can create neighbourhoods with high levels of neighbourhood social cohesion where senior citizens can age in place. We test the hypotheses that collective self-build is positively related to social cohesion and (directly and indirectly) to social satisfaction and lower levels of loneliness. The study is based on survey data from 326 respondents of 50 years and over living in 25 collective self-build development projects and 19 conventionally developed housing projects in the Netherlands. The results of a structural equation model (SEM) reveal that collective self-build is directly related to neighbourhood social cohesion and lower feelings of social loneliness. We find an indirect effect on social satisfaction. These positive relationships hold while controlling for personal and household characteristics. This quantitative study adds scientific knowledge on the collective self-build development method and its relation to social cohesion, loneliness and satisfaction.

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Collective self-build; collaborative housing; neighbourhood social cohesion; social loneliness; senior housing

Introduction

The world population is ageing (e.g., World Health Organization, 2018). In the Netherlands, it is expected that more than a quarter of the population will be 65 or over by 2030. The Dutch government is stimulating senior citizens to live independently as long as possible, aiming to curb the costs of healthcare and the associated housing costs. While many older adults also embrace this governmental intention of living independently as long as possible, it also bears certain risks. An increasing age eventually leads to a deteriorating health situation, reduced mobility and a loss of social contacts. These consequences of ageing might increase the chance of developing feelings of loneliness among seniors and it possibly negatively affects the social satisfaction of this vulnerable group.

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Neighbourhood-based social contacts become increasingly important in the social life of older adults. Also in the policy field there has been increasing attention on local community and maintenance of local connectedness and cohesion (Kennett & Forest, 2006). Neighbourhood social cohesion has been found to be an important aspect with regard to the prevention of loneliness (Weijs-Perrée *et al.*, 2015). It is therefore crucial to study how pleasant neighbourhoods can be developed where senior citizens can age in place, with high levels of neighbourhood social cohesion that prevent older adults from loneliness.

In this study we hypothesize that collective self-build housing is related to higher levels of neighbourhood social cohesion and social satisfaction among residents. In that case, collective self-build could be an interesting method for developing senior-friendly communities with high levels of social interaction, cohesion and satisfaction. Collective self-build is a development method in which a group of united individuals acquires a piece of land (or buildings) and jointly determines how they wish to develop their dwellings and living environment (e.g., Hamiduddin, & Gallent, 2016). In collective self-build, future residents are collective decision makers, who take initiative to start the development. Because future residents are involved early in the development process (in the initiative, definition or design phase) and maintain intensive contact, they already get to know each other during the development process, before moving into their home. This is an important difference with a conventional development, where a professional party such as a project developer is the initiator of the housing development project, and the residents are only involved after the sales or construction phase. Therefore, collective self-build is hypothesized to be associated with a higher level of neighbourhood social cohesion, higher social satisfaction and lower levels of social loneliness among its residents.

Collective self-build can be regarded as a form of 'collaborative housing' when using a broad definition (e.g. Czischke 2018; Fromm 2012; Lang *et al.*, 2020; Tummers, 2016). Collaborative housing or collective self-organized housing comprises a wide variety of forms, such as co-housing, community-led housing, residents' co-operatives and collective self-build initiatives (e.g. Lang *et al.*, 2020; Tummers, 2017). Co-housing started in Denmark in the 1960s and spread to other European countries such as the Netherland and Sweden and later also to the United States, Australia and Japan (e.g. Labit, 2015; Ruiu, 2016). In Europe, self-managed collective housing is (re)gaining importance in a search for affordable housing (e.g. Archer, 2020; Czischke *et al.*, 2020; Czischke & van Bortel, 2018; Lang *et al.*, 2020; Lang & Stoeger 2018) as well as to form a community (Fromm 2012; Hamiduddin, & Gallent, 2016; Tummers, 2016, 2017).

The community forming in collaborative housing has received increasing attention in the literature. Several researchers recognise that bottom-up projects such as co-housing contribute to social interaction (e.g. Glass, 2020), group cohesion (e.g. Andresen & Runge, 2002; Griffin *et al.*, 2019; Sandstedt & Westin, 2015; Seemann *et al.*, 2019), prevention of loneliness (e.g. Choi, 2004), health and wellbeing (Griffin *et al.*, 2019) and happiness (Ambrose & Stone, 2010). While a positive effect of collaborative housing on neighbourhood social cohesion has been generally assumed in the literature and collective self-build practice, empirical evidence based on

quantitative research on this matter is scarce, especially for the Dutch context (Tummers, 2016, 2017). The aim of this study is therefore to test to what extent differences in neighbourhood social cohesion, social loneliness and social satisfaction are present between seniors living in collective self-build housing projects and seniors living in conventionally developed housing projects, controlling for personal and household characteristics. These relationships are tested in a structural equation model using survey data that were collected among senior citizens living in either collective self-build housing developments or in conventionally developed housing in the Netherlands. Note that we use cross-sectional data, which implies that we cannot establish causal relationships. This means that we can only test whether differences exist between the two development types in terms of experienced neighbourhood social cohesion, social satisfaction and loneliness. We do not know if these differences are actually caused by residing in a collective self-build project, or if they are due to the fact that collective self-build projects attract more socially oriented residents.

The remainder of this article is organised as follows. The next section briefly presents the literature review in which the collective self-build method is further elaborated and the factors affecting the neighbourhood social cohesion, feelings of social loneliness and social satisfaction are described. Next, the data collection and the descriptive statistics are addressed. The results of the structural equation model are presented and discussed in the subsequent section. The final section draws conclusions and suggests implications for further research.

Background and literature

This section first gives more background information on collective self-build in the Netherlands. After that, the existing literature on neighbourhood social cohesion, social satisfaction, and social loneliness is discussed, followed by the literature on collaborative housing in relations to neighbourhood social cohesion, social satisfaction, and loneliness. Finally, other factors influencing neighbourhood social cohesion and perceived social satisfaction and feelings of social loneliness is reviewed. This section concludes with the hypotheses of this study.

Collective self-build in The Netherlands

The collective self-build development method can best be described as a form of commissioning where a collective of like-minded households acquires a piece of land or buildings and jointly govern the (re)development. They jointly determine how the private- and public spaces are to be laid out (Boelens & Visser, 2011). Since the collective of likeminded individuals governs the development from the start, the collective self-build development method is characterized by the early involvement of the future residents in the development process (e.g. initiative phase, definition phase). The future residents generally do not know each other before the start of the project. However, they have formal and informal meetings during the collective self-build development process in which they get to know each other and

form bonds (Kapedani 2011). They furthermore compose a development team, which for example consists of an architect and construction company. A pivotal aspect of the collective self-build development practice is that the collective of individuals, who are united in a legal entity, bears all development risks. At the same time, they are in full control over the development resulting in the previously discussed ability to define the desired lay-out of the private- and public spaces.

Participants of collective self-build projects in the Netherlands vary in age, ethnic background, education level, income and household composition as well as in physical appearance, scale, housing types, location and ownership. Collectively build and self-managed housing is gaining attention from both researcher and policy makers. According to Tummers (2015, 2016) this reflects the societal trends of decentralization and citizen participation that can also be seen in other European countries. "Co-housing is an expression of contemporary citizenship, citizens actively taking the housing and environment situation in their own hand" (Tummers, 2015, p. 64). However, not all collective self-build projects in the Netherlands can be considered to be co-housing, as some are mainly focused on 'building together', rather than on 'living together'. At the beginning of this century, the Dutch government started providing subsidies for collective self-build (also called Collective Private Commissioning) with the aim to increase residents' control over their dwelling and living environment. As a result, the number and proportion of self-build dwellings in the Netherlands has increased in recent years.

The collective self-build development method significantly differs from the conventional real-estate development practice, in which a real estate developer, construction company, housing association etc. governs the (re)development. The professional party governing the (re)development is responsible for acquiring the building plot(s) or existing building(s) and for the commissioning of the required specialist parties (e.g. architect, constructor) to enable the development. The initiating party (e.g. real estate developer) bears all development risks. The conventional real estate development practice is furthermore characterized by the relatively late involvement of the future residents in the development process (e.g. sales phase) and the limited influence on development decisions of all sorts (e.g. appearance of the facades, gross floor area).

Given the description above, it can be concluded that both development types differ significantly. These differences are mainly related to the initiator, the phase of involvement, risks, responsibilities and control. Moreover, the differences are assumed to result in significantly differing outcomes on the perceived neighbourhood social cohesion, feelings of loneliness and social satisfaction of middle-aged persons and seniors.

Neighbourhood social cohesion, social satisfaction, social loneliness

Social connections are crucial to people's quality of life. Currently, feelings of loneliness and social exclusion are increasing (e.g. Griffin, 2010), as people have started to live longer, more often alone and childless, further away from friends and family and more isolated from others. Loneliness and social isolation have a detrimental impact on people's health (e.g. Glass &Vander Plaats, 2013; Glass, 2020). Loneliness

can be defined as "the subjective evaluation of the situation individuals are involved in, characterized either by a number of relationships with friends and colleagues which is smaller than is considered desirable (social loneliness), as well as situations where the intimacy in confidant relationships one wishes for has not been realized (emotional loneliness)" (De Jong-Gierveld & van Tilburg, 2010, p. 121). Loneliness is at all times an unpleasant, inadmissible feeling, which significantly differs from just being alone.

Although loneliness occurs among all age groups, it is more prevalent among older adults. Senior citizens often have a smaller social network due to changes in their life cycle stage, critical life events such as the decease of relatives and friends, the absence of children, higher female employment rates and increasing geographical distances between individuals included in the social network (Van Dijk *et al.*, 2013). Senior citizens tend to stay longer and spend more time in their neighbourhood. Therefore, the local, neighbourhood-based social network of seniors becomes increasingly important for stimulating social inclusion, place attachment, and social satisfaction (Dobner *et al.*, 2016; Kemperman *et al.*, 2019). An extensive local social network allows for obtaining social support from persons incorporated in the local social network. A great challenge lies in the possibilities to qualitatively strengthen the local social network of seniors and middle aged persons, enabling them to establish new social relations and aiming to diminish the chances of a deteriorating emotional health, such as increasing feelings of loneliness and a decreasing social satisfaction.

Neighbourhood social cohesion is gaining importance in the ageing society as it is related to seniors' social satisfaction and it has been found to be an important aspect with regard to the prevention of social loneliness (e.g. Weijs-Perrée *et al.*, 2015). Neighbourhood social cohesion is therefore assumed to be the basis of the possible enlargement of a person's local social network, which in turn contributes to social satisfaction and a reduction of loneliness. According to Cramm & Nieboer (2015) neighbourhood social cohesion strengthens a senior's social satisfaction through the presence of a high degree of social organisation. Social satisfaction is defined by Von Hippel *et al.* (2008) as the extent to which you are satisfied with your social contacts and social network. The satisfaction with the social network significantly influences the quality of life and well-being of individuals and is therefore of significant societal importance (Delmelle *et al.*, 2013).

Social cohesion can be seen as the glue that keeps different participants of a social system together (Dekker & Bolt, 2005). Social cohesion among neighbours involves the interactions between them, the feelings of togetherness and the possibilities to live in harmony (Dekker & van Kempen, 2009). According to Forrest & Kearns (2001) there are five dimensions of social cohesion which can be distinguished at the societal level, namely common values and civic culture, social order and social control, social solidarity and reductions in wealth inequalities, social networks and social capital, and place attachment and identity. However, not all these dimensions are related to the neighbourhood level. Buckner (1988), determined three dimensions to be of interest with regard to neighbourhood social cohesion: neighbouring, psychological sense of community and neighbourhood attraction. These dimensions are incorporated in Buckner's neighbourhood cohesion instrument (NCI),

which is frequently used to measure the perception of neighbourhood social cohesion by different age groups in the United States as well as in the European context.

Neighbourhood social cohesion, social satisfaction, social loneliness and collaborative housing

Collaborative forms of housing have been found to contribute to group cohesion (e.g. Andresen & Runge, 2002; Sandstedt & Westin, 2015; Seemann *et al.*, 2019) and prevention of loneliness (e.g. Choi, 2004; Glass & Vander Plaats, 2013). The main advantage of joint building ventures (Baugruppen) in Germany according to the study by Seemann *et al.* (2019) was the contribution to neighbourly cohesion and supportive relationships. According to Choi (2004) co-housing schemes in northern European countries were developed to reduce loneliness of older adults. Their study shows that the majority of the sample (N = 536) are satisfied with their current life in senior co-housing in Sweden and Denmark and nearly all respondents would recommend others to move to senior co-housing. A study by Sandstedt & Westin (2015) also indicates that co-housing residents in the second half of life are searching for a sense of community in their everyday life and see co-housing as a way to escape loneliness and isolation.

Co-housing is generally seen as a good solution for the ageing population as it contributes to the need for social participation and collective solidarity (e.g. Labit, 2015). According to Glass (2020, p. 8) senior cohousing "holds the promise of helping to lessen social isolation by facilitating social connections and solidarity in aging together". Glass & Vander Plaats (2013) state that senior co-housing can result in benefits of for older adults through the mechanism of communal coping, which consists of a belief that it is better to deal with aging together instead of alone, to share resources and information and to deal with the stressor of aging together. This naturally requires frequent interaction between residents. In addition, this requires residents to choose to age together in an intentional way (Glass & Vander Plaats, 2013). Andresen & Runge (2002) conclude that "living in a co-housing scheme for seniors offers a health-promoting and disease-preventing environment for the people who actively choose to live this way" (Andresen & Runge, 2002, p. 165). This suggest that actively choosing to live and age together is a precondition for experiencing the benefits of co-housing.

Moreover, there seem to be other preconditions for residents of collaborative housing to experience neighbourhood social cohesion and social satisfaction. For instance, group size and composition are important (Labit, 2015). Boelens *et al.* (2010) find that smaller projects result in higher levels of neighbourhood cohesion. Similarly, Williams (2005) indicates that there are fewer social interactions in large communities. On the other hand, Van den Berg *et al.* (2021) find that a large project size is positively related to perceived neighbour support. Homogeneity in sociodemographic and cultural background and values seems to be a precondition for group cohesion (Bresson & Labit, 2020; Hamiduddin, & Gallent, 2016; Labit, 2015). Higher levels of age homogeneity have been found to be related to higher levels of neighbourhood social cohesion (Van den Berg *et al.*, 2021). Hamiduddin, & Gallent, (2016, p. 375) state that "cohesion was found to form between households with

similar educational backgrounds, similar values, and those occupying broadly the same socio-economic class." This indicates that collaborative housing projects can be beneficial to neighbourhood social cohesion among older adults, although these projects are not very inclusive to some vulnerable groups.

Moreover, while the collective nature of co-housing can offer benefits, the possibility of both autonomy and privacy are underscored as well (e.g. Sandstedt & Westin, 2015). Andresen & Runge (2002) found that for some co-housing can have a negative effect as they feel guilty when they leave the co-housing too often. A lack of privacy in very small communities could have negative effects and result in withdrawal from social interaction (Williams, 2005). In the Dutch model of collective self-build, much emphasis is put on preserving privacy of residents.

In co-housing, participation in common activities in co-housing could promote a sense of community (Choi & Paulsson, 2011). The main mechanism through which social interaction (which is key for neighbourhood social cohesion) is promoted in co-housing seems to be the regularly organised social activities within the communal spaces, such as meals, parties, cultural events and maintenance activities (Williams, 2005). In collective self-build, these communal spaces are not always present.

However, even when the main focus of collective self-build is not on living together, residents do get to know each other during the design and building process. For instance, Hamiduddin, & Gallent, (2016) found that participants believed that the collaborative nature of group-build would result in greater community cohesion. Fuller (2017) studying a German Baugruppe (which is similar to the Dutch collective self-build model), strikingly argues that "while the Baugruppe focuses much of its attention on planning and building a house that will build a community, it is rather the community of the Baugruppe that is producing the relational space of future inhabitation" (Fuller, 2017, p. 604). Therefore, even when the main focus is not on co-housing, collective self-build is still likely to contribute to neighbourhood social cohesion. In these collective self-build projects, getting to know fellow residents during the development process (through meetings and activities during the development process) contributes to the formation of a collaborative lifestyle in the project, which in turn promotes social cohesion and access to social support from neighbours (van den Berg *et al.*, 2021). The positive effect of collaborative housing on neighbourhood social cohesion is thus likely due to the social interaction between residents during the development process as well as after moving in.

Other factors influencing neighbourhood social cohesion, social satisfaction, loneliness

While this study hypothesizes that neighbourhood social cohesion, social satisfaction and social loneliness are related to the type of housing development, existing studies have shown that personal and household characteristics as well as housing project characteristics may also affect these variables. For instance, females have been found to interact more with neighbours (Van den Berg *et al.*, 2015) and therefore might experience higher levels of neighbourhood social cohesion. Bonsang & van Soest (2012) found that women experience higher levels of social satisfaction. Existing research indicated that an increasing age might result in less local social interaction,

increasing feelings of social loneliness and a diminishing social satisfaction as a consequence of a decreasing health situation (e.g., impaired mobility, memory related problems) (Von Hippel *et al.*, 2008). Oh & Kim (2009) found significant effects of marital status, employment, home-ownership and length of residence on neighbourhood social cohesion. Other personal and household characteristics which might affect the endogenous variables under study are education level, income, household composition, car-ownership, walking and cycling in the neighbourhood, and participating in voluntary work or club activities (Bonsang & van Soest, 2012; Delmelle *et al.*, 2013; Weijs-Perrée *et al.*, 2015). Furthermore, characteristics of the housing project might affect the neighbourhood social cohesion, feelings of social loneliness and the social satisfaction of the respondents. As indicated before, homogeneity of residents can contribute to neighbourhood social cohesion. Group size may also be relevant. Furthermore, dwelling type and home-ownership might significantly influence the neighbourhood social cohesion. Residents living in owner-occupied dwellings are assumed to experience neighbourhood social cohesion to a larger extent than residents living in rental facilities (Oh & Kim, 2009). The subsequent distinctive variable is the presence of common facilities. Finally, information is obtained regarding the neighbourhood density. The available literature regarding this variable assumes the presence of a negative relationship between (very) dense areas and neighbourhood social cohesion (Van den Berg *et al.*, 2015). These personal, household and housing project characteristics will be incorporated in our study as control variables to test whether there is a significant relationship between collective self-build and the three endogenous variables while controlling for personal and household characteristics.

Hypotheses

As discussed before, collaborative housing forms have been found to result in positive social outcomes (e.g. Andresen & Runge, 2002; Choi, 2004; Glass & Vander Plaats, 2013; Sandstedt & Westin, 2015; Seemann *et al.*, 2019). In line with these findings, we hypothesize that residents of collective self-build projects experience higher levels of neighbourhood social cohesion and social satisfaction and lower levels of social loneliness. As these social aspects are also related to personal, household and housing project characteristics, we control for these variables. In addition, as neighbourhood social cohesion has been found to be related to social satisfaction and absence of social loneliness (e.g. Weijs-Perrée *et al.*, 2015), we hypothesize an indirect relationship between collective self-build and social satisfaction and absence of social loneliness, via neighbourhood social cohesion. This results in the following hypotheses, which are visualized in Figure 1 and will be tested in this study:

- H1: Controlling for personal, household and housing project characteristics (paths f in Figure 1) there is a positive relationship between collective self-build and neighbourhood social cohesion (a).
- H2: Controlling for personal, household and housing project characteristics (f) there is a direct and positive relationship between collective self-build and social satisfaction (b).

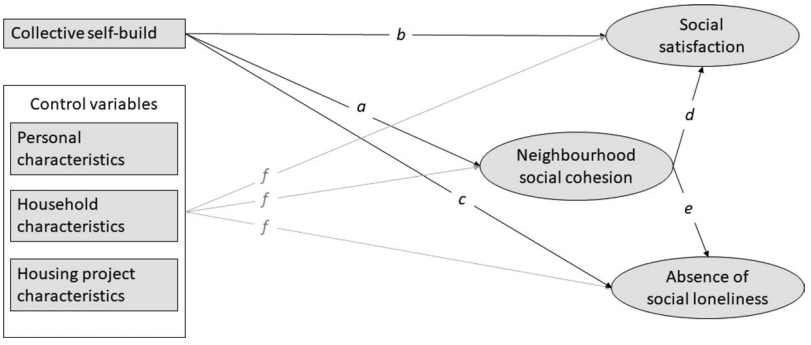

Figure 1. Conceptual model.

- H3: Controlling for personal, household and housing project characteristics (f) there is a direct and positive relationship between collective self-build and absence of social loneliness (c).
- H4: There is an indirect positive effect of collective self-build on social satisfaction, via neighbourhood social cohesion (a × d).
- H5: There is an indirect positive effect of collective self-build on absence of social loneliness, via neighbourhood social cohesion (a × e).

Data collection and sample descriptives

This section discusses the data collection instrument, the field work and the sample characteristics.

Data collection instrument

A questionnaire was designed to collect the needed data for this study. In this study, there are three endogenous variables: neighbourhood social cohesion, social satisfaction and absence of social loneliness.

To measure neighbourhood social cohesion, we used the 18-item Neighborhood Cohesion Instrument (NCI) developed by Buckner (1988). The literature review indicated that this commonly used instrument serves the acquiring of the desired data properly. The NCI consists of 18 items, categorised by the dimensions neighbouring, psychological sense of community and neighbourhood attraction. Examples include "I feel I belong to this neighbourhood", "I plan to remain a resident of this neighbourhood for a number of years" and "I visit neighbours in their homes". The respondents were asked to indicate the extent to which they agreed upon the items by means of a five-point Likert scale, varying from (1) strongly disagree to (5) strongly agree. The NCI originally is a multidimensional instrument. However, for the purpose of this study, the instrument is used as unidimensional, as was done in the study of Robinson & Wilkinson (1995) and Ellaway *et al.* (2001).

For social satisfaction three items were used, asking respondents to what extent they are satisfied with the quality of contact with their local social network, with their non-local social network and with their social network as a whole.

With regard to feelings of loneliness, the literature mentioned the 11-item loneliness scale, developed by De Jong-Gierveld and Kamphuis (1985), to be an effective measurement instrument. This scale allows to measure the emotional- and the social loneliness separately. Given the scope of this report, in which contacts among neighbours are key, it has been decided to merely obtain information regarding the (absence of) social loneliness. This concept refers to having a meaningful relation with a broad group of persons, such as acquaintances, neighbours or people with common interests. To allow for obtaining the required information on social loneliness, the 5-item subscale of the original 11-item loneliness scale has been used. This subscale consists of 5 positively formulated items such as "There is always someone I can talk to about my day-to-day problems" and "there are enough people I feel close to". The items were answered on a five-point Likert, varying from (1) strongly disagree to (5) strongly agree. A higher score on this scale thus indicates less feelings (or absence) of social loneliness.

Individual, household and housing project characteristics are incorporated in this study as control variables. Hence, the survey asked about the respondent's gender, age, education level, household composition, income, car ownership, employment status, home-ownership, club or organisation memberships and participation in voluntary work. Respondents were also asked to indicate in which housing project they live. Based on the answer we determined the neighbourhood density and the project size and whether or not the project was developed following the collective self-build process. Regarding age homogeneity the respondents are asked to indicate to which extent they agree with the statement: "The other residents of the housing project in which I'm involved have more or less the same age as me". The answer possibilities utilized are: (5) completely agree, (4) agree, (3) neutral, (2) disagree, (1) fully disagree.

Fieldwork

The data were collected between October and December 2019. A door-by-door personal approach was used in which paper and pencil surveys were handed out that were collected a week later. An inventory of suitable collective self-build projects was made through the websites of professional parties who often guide the residents governing the collective self-build development (e.g. BIEB, Kilimanjaro Wonen, De Regie, Urbannerdam, and Vastgoedregisseur). The sample of the conventional developed lifetime homes is established via an internet search and communication with professional parties such as real-estate developers, construction companies and brokers. We aimed for comparable samples of collective self-build and conventional housing in terms of housing type and year of development. In total 25 collective self-build projects and 19 conventionally developed projects were included in the study. Most projects are located in the province Noord-Brabant, although also projects in Gelderland, Zuid-Holland, Overijssel, Flevoland and Utrecht are in the sample. We focused on residents aged 50 or over, and who are living in lifetime homes, which are homes with easy access, all functions on one level, so no stairs, and that require low maintenance. In total, 326 useful questionnaires have been collected. The sample is balanced, since 164 participants are living in a collective self-build

development and 162 respondents reside in conventionally developed housing facilities.

Sample characteristics

The descriptive statistics of the sample can be seen in Table 1.

The average age of the respondents is almost 72. The respondents in the conventionally developed housing projects are slightly older than the respondents in the collective self-build projects. Regarding gender the sample shows a balanced distribution. Half of the sample has a high education (BSc or higher) and low and medium educated respondents each make up a quarter of the sample. Table 1 indicates that respondents of collective self-build projects are more likely to be higher educated. Roughly one third of the respondents live alone and two thirds live with a partner. The majority of respondents in conventional developments live in large housing projects with over 30 dwellings, while the majority of respondents in collective self-build live in medium sized projects of 10-30 dwellings. The large majority of residents of collective self-build housing own their dwelling, while in conventional developments the distribution between owner-occupied and rental dwellings is more balanced.

Table 1. Sample characteristics.

	Total sample	Collective self-build	Conventional development
	N = 326	N = 164	N = 162
Personal, household and housing project characteristics			
Age (mean)	71.94	70.51	73.39
Male	52%	51%	53%
Female	48%	49%	47%
Low education (primary)	25%	14%	36%
Medium education	26%	20%	31%
High education (BSc or higher)	50%	66%	33%
Single person household	37%	41%	34%
Couple	63%	59%	66%
Low income (<2500,- per month)	32%	31%	33%
Medium income	44%	37%	51%
High income (>3500,- per month)	24%	32%	15%
Housing project size <10	18%	24%	11%
Housing project size 11-30	36%	54%	19%
Housing project size >30	46%	22%	70%
Year of residence 2017-2019	59%	48%	70%
Year of residence 2010-2016	25%	38%	11%
Year of residence 1989-2009	16%	14%	19%
Not urbanized (rural) area	27%	13%	41%
Moderately urbanized area	22%	24%	19%
Strongly urbanized area	51%	63%	40%
Type of dwelling: house	39%	35%	43%
Type of dwelling: apartment	61%	65%	57%
Owner occupied dwelling	68%	91%	44%
Rental dwelling	32%	9%	56%
Number of cars in household (mean)	1.96	1.96	1.95
Bicycling frequency (mean 1-8)	5.73	6.38	5.07
Organisation memberships (mean)	1.86	2.12	1.60
Perceived age homogeneity in project (1-5)	3.15	3.21	3.09

SEM results

A structural equation model was conducted as this allows to incorporate both latent variables and observed variables and to simultaneously estimate the direct relationships between collective self-build and the three endogenous variables, as well as the indirect relationships between collective self-build and social satisfaction and (absence of) social loneliness, via neighbourhood social cohesion, while controlling for personal and household characteristics. The SEM consists of a measurement model that specifies how the indicators are related to the latent variables, and a structural model that specifies the relationships between the endogenous and exogenous variables. The model was estimated using the statistical software package LISREL (version 8.54; Jöreskog & Sörbom 2003). The maximum likelihood method was used to estimate the models. A number of different model specifications were tested, with different (transformations and levels of) explanatory variables. We let the error terms of the three endogenous variables correlate. Initially, all explanatory variables presented in Table 1 were entered in the model. To obtain a parsimonious model, personal and household characteristics that were not significantly related to any of the endogenous variables were removed from the model in a stepwise manner. As a result, the variables age, income, education level, length of residence, household composition, home ownership, housing project size and age homogeneity in the project do not appear in the final model.

Table 2 shows the relationships between latent variables and measurement items. The standardized coefficients and t-statistics of the final model are shown in Table 3. Table 4 shows the fit statistics of the model. The Chi-square statistic divided by the degrees of freedom is 3.06. Recommendations for this statistic differ; some suggest it should be less than 2, while other indicate it should be less than 5 (Hooper *et al.*, 2008). For a good model fit, the value of the root mean square error of approximation (RMSEA) should be less than 0.08 (Hooper *et al.*, 2008). The RMSEA value of 0.087 of our model indicates a modest fit. The Standardized Root Mean Square Residual (SRMR) is 0.072 and should be below 0.08. The model's normed fit index and comparative fit index are around 0.90, which again indicates a modest fit. The R-squares indicate that 8% of the variance in neighbourhood social cohesion is explained by the explanatory variables; 47% of variation in social satisfaction is explained and 49% of variation in social loneliness.

Figure 2 shows the structural equation model with the standardized direct effects. As hypothesized, we find that collective self-build is positively associated with neighbourhood social cohesion, which confirms H1. This finding is in line with the notion that collaborative bottom-up projects contribute to social interaction (e.g. Glass, 2020) and group cohesion (e.g. Andresen & Runge, 2002; Sandstedt & Westin, 2015; Seemann *et al.*, 2019). We do not find a significant direct effect of collective self-build on social satisfaction. This means that H2 is rejected. We do find that collective self-build is directly associated with absence of social loneliness, while controlling for personal and household characteristics. This confirms hypothesis H3 that lower levels of social loneliness are present in collective self-build projects.

The results also indicate that there are indirect effects of collective self-build on social satisfaction (H4) and absence of social loneliness (H5), via neighbourhood

Table 2. Estimates for latent variables in the SEM – completely standardized coefficients.

	Social cohesion	Social satis-faction	Absence of loneliness
Satisfaction with quality of contact with local social network		0.54	
Satisfaction with quality of contact with non-local social network		0.37	
Satisfaction with social contacts and social network as a whole		0.81	
I feel like I belong to this neighbourhood	0.53		
The friendships and associations I have with other people in my neighbourhood mean a lot to me	0.71		
If the people in my neighbourhood were planning something I'd think of it as something "we" were doing rather than "they" were doing	0.58		
I think I agree with most people in my neighbourhood about what is important in life	0.43		
I feel loyal to the people in my neighbourhood	0.60		
I would be willing to work together with others on something to improve my neighbourhood	0.57		
I like to think of myself as similar to the people who live in this neighbourhood	0.31		
A feeling of fellowship runs deep between me and other people in this neighbourhood	0.72		
Living in this neighbourhood gives me a sense of community	0.78		
Overall, I am very attracted to living in this neighbourhood	0.64		
Given the opportunity, I would like to move out of this neighbourhood	−0.46		
I plan to remain a resident of this neighbourhood for a number of years	0.52		
I visit my neighbours in their homes	0.54		
If I needed advice about something I could go to someone in my neighbourhood	0.60		
I believe my neighbours would help me in an emergency	0.52		
I borrow things and exchange favours with my neighbours	0.59		
I rarely have neighbours over to my house to visit	−0.40		
I regularly stop and talk with people in my neighbourhood	0.50		
There is always someone I can talk to about my day-to-day problems			0.74
There are plenty of people I can lean on when I have problems			0.81
There are many people I can trust completely			0.83
There are enough people I feel close to			0.76
I can call on my friends whenever I need them			0.68

Table 3. SEM results – standardized coefficients.

	Neighbourhood social cohesion		Social satisfaction		Absence of social loneliness	
	Direct (t)	Total (t)	Direct (t)	Total (t)	Direct (t)	Total (t)
Neighbourhood social cohesion			0.68 (3.17)	0.68 (3.17)	0.63 (2.80)	0.63 (2.80)
Collective self-build	0.17 (2.84)	0.17 (2.84)		0.11 (2.26)	0.15 (2.62)	0.26 (4.49)
Gender: male			−0.10 (1.96)	−0.10 (1.96)		
Type of dwelling: house	0.13 (2.24)	0.13 (2.24)		0.09 (1.92)		0.08 (1.84)
Bicycling frequency					0.13 (3.01)	0.13 (3.01)
Number of organisations	0.18 (3.00)	0.18 (3.00)		0.12 (2.34)		0.11 (2.20)
Number of cars					−0.13 (3.05)	−0.13 (3.05)
Rural area			−0.12 (2.38)	−0.12 (2.38)		
R^2	0.08		0.47		0.49	

Table 4. SEM fit statistics.

Degrees of Freedom	468
Minimum Fit Function Chi-Square	1433.67
Chi-Square/Degrees of Freedom	3.06
Root Mean Square Error of Approximation (RMSEA)	0.087
Normed Fit Index	0.88
Comparative Fit Index	0.91
Standardized Root Mean Square Residual (SRMR)	0.072

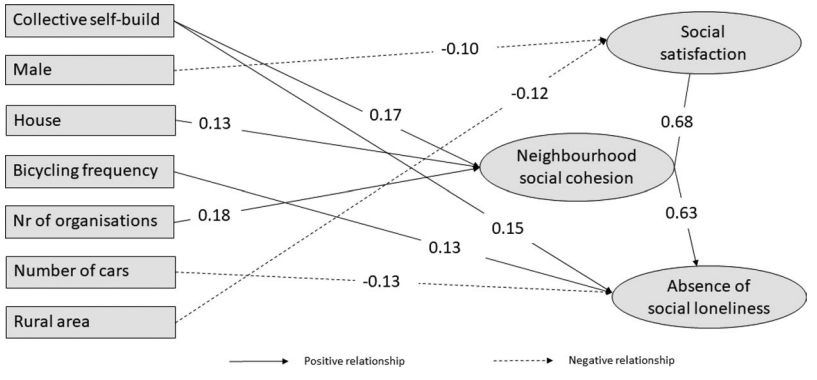

Figure 2. SEM results – standardized direct effects.

social cohesion. Thus, collective self-build is positively related to neighbourhood social cohesion, and neighbourhood social cohesion in turn is positively related to social satisfaction and absence of social loneliness. This is in line with for instance, Cramm & Nieboer (2015) who indicated that neighbourhood social cohesion strengthens a senior's social satisfaction through the presence of a high degree of social organisation and Weijs-Perrée *et al.* (2017) who found that neighbourhood social cohesion substantiates the social satisfaction of a person. Similarly, Glass found a strong correlation between loneliness and sense of community on senior co-housing projects that were specifically designed to promote social interaction. The total effects shown in Table 2 represent the sum of the direct and the indirect effects.

Regarding the personal and household characteristics that were included as control variables in the model, the results show several significant relationships as well. The results show that males on average experience lower levels of social satisfaction. This finding is in line with the expectations, since previous research indicated that females are more socially satisfied than males (Bonsang & van Soest, 2012). We find that residents living in a single-family dwelling experience higher levels of neighbourhood social cohesion. People who cycle more often, are found to experience lower levels of social loneliness. This is partly in line with Weijs-Perrée *et al.* (2015) who found that cycling in the neighbourhood is related to more social interaction with neighbours, which in turn is related to social satisfaction. Being a member of more clubs or organisations is related to a higher experienced neighbourhood social cohesion. This is in line with Putnam (2000) who argued that participation in local organisations creates social cohesion among neighbours. The number of cars in the household is positively related to social loneliness, indicating that people who own a car are more likely to feel lonely. This is a surprising finding that contradicts the finding of Weijs-Perrée

et al. (2015) and Delmelle *et al.* (2013) that car ownership is related to higher social satisfaction. Finally, the results show that people living in a rural area experience a lower social satisfaction. This might be related to the fact that fewer persons live in these areas which limits the opportunities for spontaneous social interactions.

Conclusion

This study aimed to analyse the relationships between collective self-build development housing and neighbourhood social cohesion, social satisfaction and feelings of social loneliness. Survey data collected in 2019 from 326 residents aged 50 years or over living in lifetime homes that were either developed conventionally or through collective self-build, allowed for a comparison of both types of development regarding the endogenous variables. Furthermore, individual and household characteristics have been incorporated in this study as control variables in the analysis.

To the best of the authors' knowledge, this study is the first large scale quantitative research on the collective self-build development method and how it relates to neighbourhood social cohesion, feelings of social loneliness and social satisfaction. The study therefore expands the scientific knowledge concerning the functioning of this development method and its benefits for social well-being. Moreover, the results have implications for policy makers, and housing developers on how to create a senior friendly living environment with high levels of neighbourhood social cohesion.

The findings of this study indicate that, while controlling for personal, household and housing project characteristics, there is a positive relationship between collective self-build and social cohesion. This was hypothesized in H1. This can probably be explained by the early involvement of residents in the project, allowing for the development of neighbourhood-based social networks, even before residents move into their homes. We also find that collective self-build is both directly and indirectly (via neighbourhood social cohesion) associated with absence of social loneliness, while controlling for personal and household characteristics, confirming H3 and H5. Collective self-build is only indirectly related to social satisfaction, via neighbourhood social cohesion. This indicates that hypothesis 2 is rejected, while the other four hypotheses are confirmed.

The findings suggest that the collective self-build development method could be an effective supportive method to substantiate the neighbourhood social cohesion. It can therefore be recommended to policy makers to increase the share of grounds destined for collective self-build developments in their zoning plans and policies and stimulate collective self-build through subsidies, not only in the Netherlands, but also in other (European) cities and countries that aim to promote neighbourhood social cohesion. It would also be recommendable to increase awareness of the added value of the collective self-build development among older adults. Private parties, for instance collective self-build process coordinators should focus on organizing activities with future residents of the projects to stimulate social interaction and the development of local social networks. This way, housing projects can be developed with high levels of social interaction and cohesion that prevent older adults from feelings of social loneliness.

While this study presents interesting findings, further research is needed in the area of collective self-build. This is a cross-sectional study, which means that

causality cannot be demonstrated. In order to do so, longitudinal data would have to be collected. It would also be recommendable to incorporate residential mobility in subsequent studies. Some of the respondents indicated that due to the move of some residents the neighbourhood social cohesion declined, particularly when residents who had an initiating role in the collective self-build development process, left.

Another point of attention is the risk of a self-selection bias. People who find social interaction and cohesion more important, may be more likely to self-select into collective self-build projects. For future research projects it is suggested to include survey questions on the extent to which social interaction and cohesion played a role in their decision to participate in the project.

According to literature, length of residence, which is correlated with age, is an important determinant regarding the perceived neighbourhood social cohesion. In our study length of residence and age were not significantly related to any of the endogenous variables. We sampled residents aged 50 or over living in lifetime homes. The majority of projects consisted of recently developed homes, realized after 2010. It is therefore desirable to compose a sample with a higher share of collective self-build projects realized before 2010.

Moreover, it would be interesting to conduct a similar type of research in other countries where collective self-build is used as a housing development method to see if results in different cultural contexts are comparable. It would also be interesting to focus on different target groups, such as starters, to assess the relations between the collective self-build development method and neighbourhood social cohesion, social satisfaction and feelings of social loneliness for this target group.

Although further research is needed, this study has shown that the collective self-build development method is positively related to neighbourhood social cohesion, social satisfaction and reduced the feelings of social loneliness among residents of lifetime homes aged 50 and over. All these aspects gain in importance for the ageing society, as older adults are assumed to live independently as long as possible and rely to an increasing extent on their local network for social support. Collective self-build is a development method that seems to contribute to this support and the overall well-being of the ageing population.

Disclosure statement

No potential conflict of interest was reported by the authors.

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