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# Towards better home design for people in temporary accommodation: exploring relationships between meanings of home, activities, and indoor environmental quality

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## Abstract

People living in short-term rental housing, henceforth temporary housing, are rarely consulted by professionals involved in the design process, whether regarding new or refurbished buildings. Knowing what is required for temporary dwellers to feel at home and how their meanings of home relate to household characteristics, activities, and indoor environmental quality, might result in better designs for these commonly small dwellings. To explore the views of temporary occupants about their home environment, we designed and conducted a survey directed to young people in the Netherlands, likely to be familiar with living in temporary accommodation (141 university students, 58 refugees who have received a permit to stay; henceforth named permit holders), 23 persons who were working 4 days and studying 1 day; henceforth named starters). Through factor analysis, six meanings of home were found to be statistically significant: Representation, privacy, sociability, rootedness, future, and appropriation. Multiple regression analyses and analyses of variance indicated that meanings of home were related to some household characteristics and the presence of light and cleanliness. Our study showed that measuring meanings of home might help understand not only how dwellings are used but also how to improve the design of small temporary dwellings. For instance, more possibilities for good or natural light, storage, and the display of personal possessions should be incorporated into the design of these small dwellings.

**Keywords** Home · Activities · IEQ · Household characteristics · Design · Temporary · Accommodation

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## 1 Introduction

Everyone should be able to call a place home, though unfortunately, not everyone can. In the Netherlands, households with a low income have been struggling to find affordable housing for over two decades (Boelhouver, 1999; Scanlon et al., 2015). Students and permit holders mostly depend on social housing associations. However, waiting lists are long and it can take up to ten years until someone signs a rental contract. There is a shortcut if someone receives the ‘urgent’ status: In this case the person must accept the first dwelling available, without any choice. People who have finished their education are forced to move out of their student housing and would need to subscribe to the waiting list. In the absence of a decent job or family support, one could not afford to rent or buy from the private market given the exorbitant increase of housing prices (CBS, 2022).

The Dutch government proposed to temporarily transform existing vacant buildings (e.g., offices, schools, etc.) into housing to reduce the shortage. In practice, this means that the building is made into an apartment building with a minimum investment for a maximum of ten to twenty years, before it is restored to its previous function. Building transformation can be faster, cheaper, and more sustainable, than building anew (Remøy & van der Voordt, 2014; Remøy et al., 2007). There are however potential downsides to this approach. In particular, less opportunities for personalisation, less homely environments, and more lenient building regulations, including those on indoor environmental quality (IEQ) (for example, thermal and sound insulation and daylight admittance (Ton et al., 2014)).

In addition to the shortage of affordable housing in the Netherlands, there is also a shortage of knowledge about their use of homes. Specifically, for people living in temporary accommodation, like students, refugees with a permit to stay (henceforth named ‘permit holders’ and other people who are wishing but unable to enter the housing market (henceforth named ‘starters’), the available information on their housing needs, wants, and meanings, is limited. To minimise building complexity, time, and costs, dwelling units in these transformed buildings tend to be very similar despite the diversity in the socio-demographic profile of temporary dwellers. Given that these temporary dwellers often must accept the first dwelling available, it is even more important that the dwelling can be adjusted as much as possible to fit their needs. While basic housing quality is ensured through building regulations, there are none to ensure that the dwelling can be a home. For instance, renters are less likely to personalise their dwelling when they feel insecure, which negatively impacts their well-being (Easthope, 2014). For temporary rental contracts the negative impact on wellbeing might be even stronger.

Herewith, the overall aim of the paper is to make recommendations for improving the design of temporary dwellings for students, permit holders, and starters, by examining how meanings of home relate to home activities and preferred IEQ. To our knowledge, the relationships between these three topics have not been so far systematically explored. To achieve our aim, we created a new questionnaire to measure variations in people’s meanings of home and the ways in which such meanings can relate to activities in the home and IEQ, through factor analysis and multiple regression analyses. The paper will proceed with a brief literature review in which we discuss in turn the topics of IEQ and user preferences; behaviour and building design; and meanings of home, trying to relate them to temporary dwellers. In the following method section, we present others’ and our operationalisation of meanings of home, and give full details on how we tested the questionnaire. We then move to discuss the results, and make some recommendations for the design of temporary dwellings.

## 2 Literature review

### 2.1 IEQ and user preferences

Part of the building regulations concern IEQ, such as the requirement of daylight access or ventilation. Studies have shown that perception of IEQ varies, and that it relates to differences in for instance, preferences, the built environment, climate, gender, age, and satisfaction (Baird et al., 2018; Bluysen, 2020; Kraus & Novakova, 2019; Zalejska-Jonsson & Wilhelmsson, 2013). Additionally, residents manage and improve their indoor environment in different ways (Andersen et al., 2009; Lee et al., 2011; Zalejska-Jonsson & Wilhelmsson, 2013). Therefore, it is conceivable that although the quality standards of transformed buildings may be lower than for new buildings, dwellers could still be satisfied from the perspective of it being a home.

These differences and how they are controlled might be related to how residents use their dwelling and what meanings home has for them. For example, a ventilation system where the controls are unclear may prohibit someone from cooking odorous foods in a studio apartment even though cooking a specific type of food may be part of someone's identity. Having big openable windows instead of the newest ventilation system might then be a quality.

Designing for unknown dwellers requires designers to make assumptions which are not always correct. For instance, which types of households will use the dwelling (Darke, 1984) or which façade materials (Cooper Marcus et al., 1986) and floor plan lay-outs are preferred (Boumová & Zdráhalová, 2016). Energy use and control of ventilation systems (Guerra Santin et al., 2009) are also sometimes different than expected. Knowing how these differences relate to dwellers would make it easier to design fitting temporary housing.

Preferences, personal values, and lifestyles have been studied in housing research to identify what different user groups want from a dwelling (Ergan et al., 2018; Jansen, 2011, 2013; Jansen et al., 2011; Michelson, 1977; Ouwehand & Doff, 2011). Preferences are often about the 'ideal' home (Michelson, 1977; Sirgy et al., 2005), rarely about other types of housing, such as student accommodation (Oppewal et al., 2005). However, the results from such research are not always informative for designers. For instance, students preferred private studio flats over co-housing (Verhetsel et al., 2017). This finding informs us on the preferred housing type but not on the interior or floor plan. Another example is preferences of resettled refugees relating to proximity of relatives, location, and connectedness with the place of residence (van Liempt & Miellet, 2020). These factors cannot be addressed by the design of the building. Therefore, recommendations for design should be at the level of the home interior.

### 2.2 Behaviour and home design

There is some research about interiors and how people use a temporary dwelling. Lewinson (2010) found that people living in extended stay hotels positively emphasised options that made it possible to use the room more like a home; for instance, having a kitchenette in the room increased homeliness. Kellett and Moore (2003) discovered that the same hotel room resulted in different behaviours and attributed meanings by the occupants; meanings of home related more to social dimensions for some, while for others it related more to

comfort and physical features. Thus, dwelling design could be improved when relationships between the physical environment and different meanings of home are better understood.

Dwelling design is based on how much and what type (level of privacy) of space is necessary around objects that are needed for certain activities. (Leupen & Mooij, 2011). Consequently, in housing, the size, shape, and organisation of rooms partly depends on which activities (e.g., sitting, cooking, reading, sleeping, etc.) are expected to take place in them. Guidebooks for the design of space assume people perform an activity in the most space-efficient way. For example, two people sitting at a table need six square meters to place the necessary furniture and physically do the activity (Neufert et al., 2012). This approach, unfortunately, does not address meanings or related activities. Rapoport (1982) argued that activities consist of four parts: the activity itself, how it is performed, what it means, and what other activities are related. Furthermore, there could be benefits to designing unassigned space. The number of possible home activities in buildings that were not designed as homes (e.g., office, school, church, etc.) increased when a space seemed more undefined (Tagg, 1974). Research on the connection between 'home' and activities in research is rare (Clapham, 2011), even though connecting the physical to the psychological could provide new insights in healthy lifestyles and behaviours at home (Graham et al., 2015). Thus, considering meanings and relationships might result in healthier and better dwelling design.

### 2.3 Reviewing meanings of Home

Meanings of home have been researched for decades and from different perspectives, which is why we give only a brief overview (see for example Despres, 1991; Mallett, 2017; Marcus, 2006; Moore, 2000 for more detailed overviews). We focus on differences between people and how they are part of the process of creating a home.

Home has been researched as a process (Brun & Fábos, 2015; Marcus, 2006), something that becomes (Feldman, 2016), something that grows (Dovey, 1985), or something that is assembled only temporary (Soaita & McKee, 2019). Ideally, it becomes a central and fixed space in the world (Dovey, 1985) that offers a sense of control over one's life (Brun & Fábos, 2015) and helps constructing an identity (Feldman, 2016). This process is strengthened by emotional or economic investment (Brun & Fábos, 2015; Porteous, 1976). Research has shown that residents also invest in temporary homes (Brun & Fábos, 2015; Kellett & Moore, 2003), indicating that personalisation is also considered valuable when it concerns temporary housing.

Others focused on disentangling the different aspects of the meaning of home. We present six models below which were particularly relevant in grounding our own operationalisation (in random order).

The first model divides the meaning of home in three major themes, namely 'people/psychological processes', 'environmental properties' and 'temporal qualities' (Altman et al., 1985). Sub-themes are appropriation, attachment and identity, social rules and relationships, and affordances. Specific for this model is that the three major categories connect to multiple sub-themes.

The second model is based on an analysis of the meanings of home for students (Sixsmith, 1986). She found the three major themes of 'personal', 'social' and 'physical'. The first theme of the 'personal', comprised the sub-themes of happiness, belonging, responsibility, self-expression, critical experiences, permanence, privacy, time, meaningful places, knowledge and lastly the desire to return. The 'social'-theme regards type of relationships, quality of relationships, friends and entertainment, emotional environment and being with

others. The last theme 'physical' consists of structure, services, architecture, work environment and spatiality.

The third model found seven general themes (Smith, 1994). These are 'physical environment', 'presence of good social relationships', 'personal privacy and freedom', 'self-expression and development of the self-identity', 'security', 'continuity' and 'ownership'.

The fourth found two dimensions (Lawrence, 1987), a psychological dimension (self-esteem, personal identity, personal space and privacy, aspirations and goals, personal values; domestic spaces and objects, and personal preferences; house form and construction) and a social dimension (age and gender of residents, demographic structure and composition of the household, household income, employment status; social class, impact of domestic technology and socio-economic values; spaces and objects).

The fifth study focussed on meanings of attics and cellars in houses (Korosec-Serfaty, 1984) and identified five different meanings, namely appropriation, affluence and security, secrecy, remembering and forgetting, and continuity of generations.

Lastly, the sixth study named ten features of the home (Despres, 1991); security and control, a reflection of one's ideas and values, acting upon and modifying one's dwelling, permanence and continuity, relationships with family and friends, centre of activities, a refuge from the outside world, an indicator of personal status, material structure, and lastly, a place to own.

As demonstrated in the above discussion, most meanings appear more than once, though sometimes differently named, and all studies find that home consists of multiple meanings (Altman et al., 1985; Aziz & Ahmad, 2012; Despres, 1991; Dovey, 1985; Korosec-Serfaty, 1984; Lawrence, 1987; Sixsmith, 1986; Smith, 1994). The studies are all qualitative however, and therefore comparing and combining them is difficult but not impossible, as we will show in the method section.

Other studies focus on differences in specific user groups. For example, Tanner et al. (2008) found that the elderly people they interviewed sometimes valued the social aspects more than comfort or functionality in their home, and that they were less happy with dwelling modifications when these interfered with their routines. Woodhall-Melnik et al. (2017) found that for women who were victims of domestic abuse meanings of home included permanence, safety, routine, and comfort, in addition to satisfying material needs. Home could also have a negative connotation, for example for people who are displaced, old, or live in institutions (Brun & Fábos, 2015; Kellett & Moore, 2003; van der Horst, 2004). Therefore, which concepts of home are deemed most important and whether they are positive or negative seems to vary between people. Additionally, some concepts of home (e.g., appropriation, comfort) appear to be related to the physical properties of the dwelling.

### 3 Method

Building on the literature review, we developed a questionnaire to answer how meanings of home relate to temporary housing, activities in the home, and preferences for indoor environmental quality. The questionnaire was piloted with students which led to some changes in the questions before using it for this research.

The questionnaire consisted of three parts (meanings of home, activities, IEQ) and was distributed among students, permit holders (without this permit refugees are housed in asylum centres), and starters. These groups often have a temporary rental contract and/or do not have plans to stay long-term in the same dwelling (for more than five years). Moreover,

in the Netherlands they are usually living in social or subsidised housing without having had any choice at all. The questionnaire contained more questions than we analysed for this article because it was part of a larger project.

### 3.1 Meanings of home

Operationalising meanings of home has been done before. Groves (1996) categorised meanings of home with a survey (with 48 items) using predetermined categories (based on qualitative research) and confirmed six of them with a principal component analysis (continuity, privacy, identity, social, attachment, expression). Two additional categories were difficult to interpret but added to the model anyway ('context' and 'change'). The focus of this research was on employee mobility in Australia, asking the respondents to rate how characteristic the items were for their current and ideal home. Comparing renters and home-owners, Groves (1996) concluded that renters rated their current home significantly lower, indicating tenant status had an effect on meanings of home. Kearns et al. (2010) created a scale that consists of nine items and focusses on psycho-social benefits of home, in particular the elements of haven, autonomy, and status. However, meanings such as personalisation (Barratt & Green, 2017) or permanence (Nieto, 2020) are not specifically covered in their scale. Because we attempt to operationalise meanings of home with the purpose of informing designers, the scale from Kearns et al. (2010) was not sufficient. Therefore, we created a new scale with meanings of home that might be used to improve dwelling design, based on qualitative research on meanings of home (see Table 1) (Altman et al., 1985; Aziz & Ahmad, 2012; Despres, 1991; Dovey, 1985; Korosec-Serfaty, 1984; Lawrence, 1987; Moore, 2000; Seamon, 1979; Sixsmith, 1986; Smith, 1994).

The meanings were aggregated in categories: Identity, regeneration, attachment, appropriation, physical, and values (using the categories from the review from Aziz and Ahmad (2012)). The concepts were transformed into statements (apart from duplicates), to make them easier to understand and rate in a questionnaire. Categories with more than five statements were reduced to a maximum of five to limit the length of the questionnaire. Statements that made the least sense on their own or were very similar to others, were eliminated, resulting in 21 statements. The question was to 'indicate how important the following items are to you, to make a dwelling feel like home' (8-point Likert scale). The scale is similar to the one for personal values as developed by Schwartz (Schwartz, 1992), because for a psychological construct it can find differences in relative importance within and between subjects.

The objective was to find factors for meanings of home and relate them to the other variables (household characteristics, activities, and preferences for IEQ). Therefore, a factor analysis with principal component extraction was used (Meyers et al., 2006). The outcome of the analysis can also be used for following analyses (Tabachnick & Fidell, 2013). An oblique rotation method was chosen, because the factors were expected to correlate (Tabachnick & Fidell, 2013). This is similar to the method used by Groves (1996) to find meanings of home.

Different methods are available to determine the number of factors: The Kaiser criterion, inspecting the reproduced correlation matrix (Yong & Pearce, 2013), inspecting where the graph bends in the scree plot, if the factors make sense (Meyers et al., 2006), and when the factors have loadings above 0.32 (Tabachnick & Fidell, 2013; Yong & Pearce, 2013) or 0.40 (Meyers et al., 2006) Before the final number of factors was determined, all abovementioned criteria were checked because some had ambiguous outcomes.

**Table 1** The items created and the meanings of 'home' from the literature review

	Altman et al. (1985)	Sixsmith (1986)	Smith (1994)	Lawrence (1987)	Korosec-Serfaty (1984)	Dovey (1985)	Despres (1991)
1	Building something for the future	Time, permanence	Continuity		Continuity of generations	Continuity	Permanence and continuity
2	Taking care of the dwelling	Responsibility		Domestic spaces and objects			
3	Feeling that I belong with the dwelling	Belonging				Rootedness	
4	Having the desire to return	The desire to return					
5	Adjusting the dwelling to suit my wishes		Appropriation	House form and construction	Appropriation		Acting upon and modifying one's dwelling
6	Marking it as my dwelling				Affluence and security	Power	A place to own
7	Having power over what happens					Identity	Control
8	Showing who I am		Development of the self-identity	Personal identity			
9	Giving me personal space			Personal space			
10	Providing privacy	Privacy	Personal privacy and freedom	Privacy			
11	Feeling safe		Security				
12	Knowing everything about the dwelling	Knowledge					A refuge from the outside world, security



Table 1 (continued)

	Altman et al. (1985)	Sixsmith (1986)	Smith (1994)	Lawrence (1987)	Korosec-Serfaty (1984)	Dovey (1985)	Despres (1991)
13	Having and creating memories	Critical experiences, meaningful places			Remembering and forgetting	Memory	
14	Having a hiding or storing place for things			Spaces and objects	Secrecy		
15	Maintaining good social relationships	Quality of relationships	Presence of good social relationships				
16	Having my own place to sleep and eat	Structure	Physical environment				Centre of activities
17	Entertaining guests/friends at the dwelling	Friends and entertainment					Relationships with friends
18	Showing my aspirations and goals	Self-expression	Self-expression	Aspirations and goals			
19	Representing the values I have			Personal values			A reflection of one's ideas and values
20	Indicating my position in society			Social class		Social order	An indicator of personal status
21	Being with family	Type of relationships	Being with others	Demographic structure and composition of the household			Relationships with family

The factor scores were computed in SPSS using the Anderson-Rubin procedure, which creates uncorrelated factor scores even when the factors are correlated, and can be used for further analyses (Tabachnick & Fidell, 2013).

The sample size for the factor analysis was 220, which is low, but can be sufficient (Tabachnick & Fidell, 2013; Yong & Pearce, 2013). Therefore, the outcome was investigated carefully. The calculation of the communalities gave an average of 0.58, which is acceptable (Tabachnick & Fidell, 2013). The values of the non-redundant residuals were all above 0.40 in the structure matrix. In the pattern matrix, there was only one value below 0.32, at 0.314. Additionally, there was a bend in the scree plot at 6 factors, and the items in the factors made sense. There were three items that did not have inter-item correlations above 0.3 and below 0.9 ('taking care of the dwelling', 'having the desire to return to my dwelling', and 'being with family') and could therefore have been deleted (Yong & Pearce, 2013). However, they were kept because other measures were good (determinant score = 0.003, Bartlett's test of sphericity < 0.00, KMO = 0.858, anti-image matrix diagonal numbers > 0.5, to reproduce distinct factors) (Meyers et al., 2006; Yong & Pearce, 2013).

Consequently, the six factors were named (see Table 2 for the factor loadings): Representation, privacy, sociability, appropriation, future, and rootedness. Some factors had more items loading on them than others (representation and privacy had respectively 5 and 6, sociability, future, and appropriation only had 2 or 4). One item in appropriation scored negatively ('feeling that I belong with the dwelling'). This could be related to the sample considering that many respondents lived in temporary housing. The items in future, appropriation, and rootedness may not have been as relevant for this group as for, for example, an older, home-owning, group. The factors future, rootedness and appropriation were not as reliable as expected. Considering the items in each factor, the categories appear to be intertwined. Items in representation, privacy, appropriation, and rootedness, all indicate an interaction with the physical environment. For example, for appropriation, 'Adjusting the dwelling to suit my wishes' is not possible without moving objects, and, from rootedness, 'Having a hiding or storing place for things' requires space. 'Having and creating memories' related to both rootedness and sociability in the factor analysis, which could indicate that social events are often part of valuable memories.

### 3.2 Regression analyses of household characteristics

Household characteristics were entered as independent variables, with each meaning of home factor score as a dependent variable. Household type and sample group were coded with dummy variables (friends/flatmates, TU-students). Respondents living with a partner, a partner and children, or children only, were combined in one group: 'family'. Respondents who ticked 'other' and indicated they were living with siblings were grouped with 'living with parent(s)' into 'family'.

### 3.3 Regression analyses of activities & IEQ

The activities used were derived from Oseland and Donald (1993) and Tagg (Tagg, 1974), who developed a list for frequently carried out activities in the home. There were 15 activities in the list from Oseland and Donald (1993), categorised in 'peace and quiet', 'household chores' and 'relaxing'. The list from Tagg (1974) contains 30 activities, where some are more gender dependent (shaving, doing make-up), outdated (listening to records, combing hair), and have varying lengths of time (undressing,

**Table 2** Factor analysis (pattern matrix) of the meaning of home items and their factor names

	Representation	Privacy	Sociability	Future	Appropriation	Rootedness
<i>Cronbach's Alpha</i>	0.84	0.71	0.54	0.37	0.19	0.60
Indicating my position in society	0.81					
Showing my aspirations and goals	0.76					
Representing the values I have	0.74					
Showing who I am	0.71					
Marking it as my dwelling	0.65					
Providing privacy		0.76				
Feeling safe		0.71				
Having my own place to sleep and eat		0.63				
Having power over what happens		0.58				
Giving me personal space		0.56				
Adjusting the dwelling to suit my wishes		0.33				
Entertaining guests/friends at the dwelling			0.78			
Maintaining good social relationships			0.77			
Building something for the future				0.68		
Being with family				0.64		
Taking care of the dwelling					0.72	
Feeling that I belong with the dwelling					-0.43	
Having the desire to return to my dwelling						0.79
Having and creating memories						0.54
Knowing everything about the dwelling	0.30		0.34			0.52
Having a hiding or storing place for things						0.31

Extraction Method: Principal Component Analysis

Rotation Method: Oblimin with Kaiser Normalization

thinking). To limit the number of options in the questionnaire, only activities that were relatively general and related to a function of a room were included. Thus, for example cleaning, talking, and washing clothes and dishes were left out, while others were combined: Playing games, watching television, listening to music, and entertaining, would be 'relaxing' and 'receiving guests'. The question was which activities the respondents associated with sleeping, and with cooking. Additionally, there was a question on how often per week on average they perform the activities (eat, cook, study/work, relax, shower/bathe, receive guests). There was an open question on what they do to relax.

To measure preferences for IEQ, statements for office buildings (Bluyssen, 2014) were adapted to fit the home environment. Because indoor environmental building guidelines differ per function (e.g. the kitchen and bathroom require more ventilation, while rooms to stay require daylight access) (Ton et al., 2014), but not all dwellings have each of these functions in a separate room, the questions referred to the individual areas in the dwelling. The answer choices were 'not needed', 'would be nice', and 'essential'. The statements refer to the activities that are performed more than zero times a week.

The meanings of home factor scores were entered as independent variables, with the IEQ (fresh air, natural/sunlight, no sounds, clean surfaces, being warm) as dependent variables, per activity (eating, cooking, receiving guests, studying/working, relaxing, sleeping, taking a shower or bath). The answers to what people do to relax (the open-ended question) were first categorised and then coded as yes or no (watch something, read, music, hobby, social, dwelling maintenance, games). These were entered as dependent variables, and the meanings of home factors were entered as independent variables.

Subsequently, what IEQ were preferred for each of the activities (cooking, eating, studying/working, relaxing, receiving guests, sleeping, and showering/bathing) was explored with multiple regression analyses.

### 3.4 Sample

The link to the questionnaire was sent via e-mail to the following groups (only respondents who answered more than 80% were used for the analysis, which resulted in  $N=222$ ): University students ( $N=141$ ), permit holders ( $N=58$ ), and starters ( $N=23$ ). For the subsequent analyses, only respondents who answered the relevant questions were included. Thus, the number of respondents varied slightly between questions and analyses.

The students were on average younger ( $m=20.8$ ) than the starters ( $m=27.0$ ) and permit holders ( $m=26.6$ ). Additionally, students lived on average with more people ( $m=4.1$ ) than starters ( $m=2.4$ ) and permit holders ( $m=2.8$ ). Gender was evenly distributed. Most of the respondents either lived with flatmates or friends (36%), alone (24%), or with their parents (23%).

Only 7% ( $N=12$ ) lived in owned housing, while others were renting from the private market (32%), social housing market (22%), or were in student housing (39%) (total  $N=177$ ). About 37% had a temporary rental contract. From the other 63%, 58% had the intention of moving in about a year, and 68% thought that their household might change within a year. From the twelve respondents who indicated they owned their dwelling, three lived with friends or flatmates and were still studying. Only five indicated they wanted to live there for more than a year, of whom two were living with flatmates and studying. Thus, the sample mostly consisted of people who were living in temporary dwelling situations.

## 4 Results

### 4.1 Regression analyses

First, how household characteristics contributed to which meanings of home were valued was investigated with regression analyses. Included characteristics were household type, sample group, gender, age, and whether they lived in shared housing (see Table 3).

### 4.2 Relationships household characteristics with meanings of home

The permit holders were more likely to rate representation and future as important than the other respondents (see Table 3).

An additional analysis of variance (ANOVA) showed that for both 'Future' scale items, 'building something for the future language course students scored significantly higher than the university students. Regarding 'Representation', the respondents from the language course scored higher than the other groups for the items 'Showing my aspirations and goals', 'Representing the values I have', and 'Indicating my position in society' (see Table 4).

Women were more likely to rate privacy as important than men (see Table 3). Investigating the differences in items with an independent t-test, women scored significantly higher on 'Having power over what happens', 'Giving me personal space', 'Providing privacy', and 'Feeling safe' (see Table 4).

Respondents who lived alone valued privacy more, and respondents living with parents and/or siblings valued future less (see Table 3). Specifically, respondents living alone scored the items 'Providing privacy' and 'Feeling safe' significantly higher than respondents who lived with friends and/or flatmates. Respondents who lived with parents and/or siblings valued future more (see Table 3), and an ANOVA indicated that specifically for the item 'Being with family' respondents who lives with friends and/or flatmates scored significantly lower than all the other groups (see Table 4). It is likely that their ideas about privacy influenced their decision to live alone, rather than the other way around. Reasons for moving (an open question in the questionnaire) that were given were: wanting to live with flatmates, being more independent, or wanting to live with a partner. This illustrates that who one wants to live with, is part of what the home means to someone.

The other household characteristics did not show any significant relationships for the overall regression analyses (see Table 3).

Summarising, there were some differences found in what meanings were valued most for gender, household type, and sample group. The permit holders, who were following a Dutch language course, rated representation and future as more valuable than university and building academy students. Even though they were also in their twenties and enrolled at a higher education institution, they did show a different pattern for meanings of home (Figs. 1, 2).

### 4.3 Relationships between meanings of home and activities

The second step explored how the meanings of home related to activities in the home. Seven activities in the home were investigated with multinomial regression analysis, considering frequency, what other activities were associated with an activity, and what people do to relax (see Table 5).

**Table 3** Regression coefficients for household characteristics and meanings of home

	Representation		Privacy		Sociability		Future		Appropriation		Rootedness	
	$R^2$	$p$	$R^2$	$\beta$	$R^2$	$\beta$	$R^2$	$\beta$	$R^2$	$\beta$	$R^2$	$p$
<i>Sample group</i> **												
Starters	0.05	0.52	0.08	0.26	-0.01	0.92	0.06	0.42	-0.12	0.12	0.14	0.07
Refugees with a permit to stay	0.34	0.00*	0.08	0.32	-0.03	0.71	0.22	0.01*	0.04	0.60	0.16	0.05
<i>Gender</i> ***												
Male	0.00	0.98	-0.28	0.00*	-0.04	0.59	-0.03	0.71	0.09	0.20	-0.09	0.20
<i>Household type</i> ****												
Living alone	0.02	0.84	0.27	0.00*	-0.20	0.02	0.11	0.19	0.09	0.28	0.08	0.36
Living with parents/siblings	-0.16	0.05	0.13	0.10	-0.10	0.24	0.22	0.01*	-0.14	0.09	0.00	0.99
Living with partner/children	-0.09	0.30	0.14	0.09	-0.13	0.16	0.04	0.64	0.04	0.68	0.03	0.75
Age	-0.14	0.11	-0.14	0.09	-0.04	0.65	0.10	0.23	0.00	0.97	-0.23	0.01*

\* $p < 0.05$

\*\*Reference category is students

\*\*\*Reference category is women

\*\*\*\*Reference category is friends/flat mates

**Table 4** Significant differences for individual items of meanings of home factors

	<i>df</i>	<i>F</i>	<i>p</i>	<i>M</i>	<i>SD</i>
<b>Future</b>					
<i>Sample group</i>					
Building something for the future	(3, 234)	3.14	0.03		
Starters				3.74	1.07
Students				3.26	1.11
Being with family	(3, 233)	8.38	0.00		
Refugees with a permit to stay				4.07	1.10
Students				3.30	1.11
<i>Household type</i>					
Being with family	(3, 230)	9.21	0.00		
Living with friends/flat mates				3.04	1.11
Living parents/siblings				3.95	0.91
Living with partner/children				3.89	1.12
Living alone				3.46	1.31
<b>Representation</b>					
<i>Sample group</i>					
Showing my aspirations and goals	(3, 232)	14.92	0.00		
Refugees with a permit to stay				3.82	1.05
Students				2.88	1.12
Starters				2.62	1.07
Other				2.32	1.00
Representing the values I have	(3, 232)	4.39	0.00		
Refugees with a permit to stay				3.66	1.33
Students				3.21	1.08
Starters				2.86	0.96
Other				2.91	1.07
Indicating my position in society	(3,232)	14.77	0.00		
Refugees with a permit to stay				3.46	1.28
Students				2.47	1.09
Starters				2.33	1.11
Other				1.91	0.92
<b>Privacy</b>					
<i>Gender</i>					
Having power over what happens	236	2.27	0.02		
Women				3.93	0.87
Men				3.66	0.97
Giving me personal space	235	2.39	0.02		
Women				4.44	0.66
Men				4.22	0.72
Providing privacy	236	2.15	0.03		
Women				4.34	0.71
Men				4.12	0.84
Feeling safe	235	3.87	0.00		
Women				4.52	0.59
Men				4.18	0.75
<b>Household type</b>					

**Table 4** (continued)

	<i>df</i>	<i>F</i>	<i>p</i>	<i>M</i>	<i>SD</i>
Providing privacy	(3, 231)	2.68	0.05		
Living alone				4.44	0.73
Living with friends/flat mates				4.07	0.84
Feeling safe	(3, 230)	1.34	0.04		
Living alone				4.54	0.60
Living with friends/flat mates				4.21	0.79

From the activities performed at home, only frequency of receiving guests was significantly influenced by meanings of home. Respondents who valued representation, sociability, and rootedness received guests more often, while those who valued privacy received guests less often.

An inspection of which activities were associated with each other shows that respondents who valued sociability associated cooking with receiving guests more often, while those who valued rootedness associated cooking with relaxing more often. Furthermore, respondents who valued appropriation associated sleeping with working/ studying more often.

Considering what the respondents did to relax, the ones who valued representation, future, or appropriation read less often. On the other hand, respondents who valued privacy reported doing more hobby activities in the home. Therefore, valuing different meanings of home could mean that activities are performed in different ways, partly because of the meanings they are given.

#### 4.4 Relationships of meanings of home and IEQ per activity

Examining IEQ and activities (see Table 6), no significant results were found for preferences of sound or warmth. For air quality there was one significant result of the regressions analysis for showering/bathing, but none of the  $\beta$ -weights were significant. Regarding the investigated preferences for IEQ, only cleanliness and light appeared to vary based on how respondents scored on representation and sociability.

Of the activities investigated, cooking, eating, working/studying, and sleeping, did not show any significant variation in which IEQ factors were rated as essential, based on which meanings of home were valued. However, receiving guests, taking a shower/bath, sleeping, and relaxing, did show differences. Considering that the factors appropriation, future, and rootedness were less reliable than representation, privacy, and sociability, it makes sense that in these regression analyses fewer significant results were found for appropriation, future, and rootedness.

## 5 Discussion

This paper investigated whether different meanings of home can influence how homes are used, focussing on activities and preferences for IEQ. To start, a measurement for meanings of home had to be developed. Thereafter, meanings of home were related to household characteristics, activities, and preferences for IEQ.



**Table 5** Regression coefficients for meanings of home and frequency, adjacency, and type of relaxing for activities

	Representation		Privacy		Sociability		Future		Appropriation		Rootedness	
	$R^2$	$\beta$	$\beta$	$p$	$\beta$	$p$	$\beta$	$p$	$\beta$	$p$	$\beta$	$p$
Frequency												
Cooking	0.03	0.02	0.79	0.26	0.09	0.14	0.02	0.74	0.08	0.27	0.09	0.23
Eating	0.04	-0.13	0.09	0.04*	0.15	0.10	0.01	0.92	-0.02	0.76	0.01	0.93
Studying/ working	0.03	0.07	0.39	0.60	0.04	0.15	0.05	0.52	0.03	0.66	0.11	0.16
Relaxing	0.05	-0.19	0.01*	0.82	-0.02	0.46	-0.06	0.39	-0.07	0.32	0.05	0.54
Receiving guests	0.15*	0.15	0.04*	0.01*	-0.19	0.00*	-0.02	0.73	-0.01	0.93	0.16	0.03*
Sleeping	0.04	-0.06	0.42	0.57	-0.04	0.07	0.11	0.12	0.05	0.52	0.07	0.37
Showering	0.02	-0.09	0.24	1.00	0.00	0.42	0.08	0.28	0.01	0.93	0.09	0.21
Adjacency												
Cooking & receiving guests	0.10*	-0.06	0.38	0.07	-0.13	0.29	-0.03	0.63	-0.01	0.91	0.05	0.52
Cooking & relaxing	0.06*	-0.08	0.27	0.32	0.07	0.72	-0.10	0.16	-0.03	0.68	0.20	0.01*
Sleeping & studying	0.07*	0.02	0.80	0.08	-0.13	0.26	0.11	0.12	0.20	0.00*	0.09	0.21
Sleeping & showering	0.03	-0.01	0.88	0.67	0.031	0.94	-0.13	0.06	-0.05	0.43	0.09	0.21
Type of relaxing												
Watch	0.06	-0.26	0.00*	0.71	0.03	0.36	0.06	0.39	0.03	0.69	0.06	0.42
Read	0.11*	-0.16	0.03*	0.54	-0.04	0.51	-0.21	0.00*	-0.15	0.03*	0.09	0.21
Music	0.02	0.08	0.32	0.78	0.02	0.58	0.00	0.98	0.04	0.57	0.07	0.38
Games	0.03	-0.12	0.12	0.97	0.00	0.45	-0.09	0.19	-0.01	0.88	0.09	0.22
Social	0.06	0.12	0.12	0.54	-0.05	0.05*	-0.04	0.55	-0.08	0.24	0.08	0.28
Hobby	0.05*	0.02	0.82	0.17	0.17	0.03*	-0.05	0.44	-0.12	0.08	-0.09	0.23
Activity	0.03	0.08	0.31	0.88	0.01	1.00	0.07	0.34	0.05	0.44	-0.12	0.10

\*  $p < 0.05$

**Table 6** Regression coefficients for meanings of home and IEQ per activity

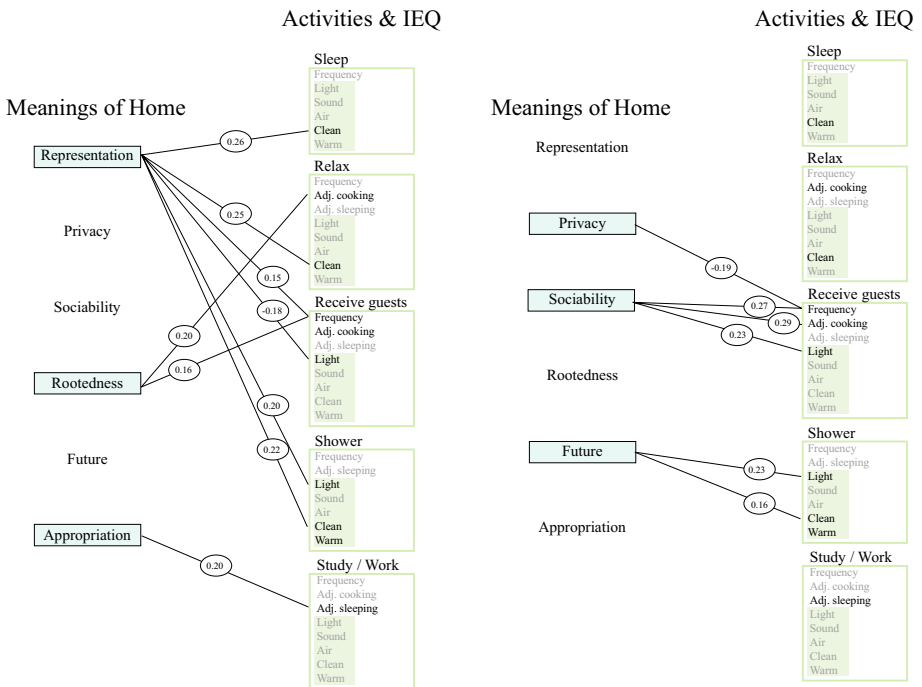
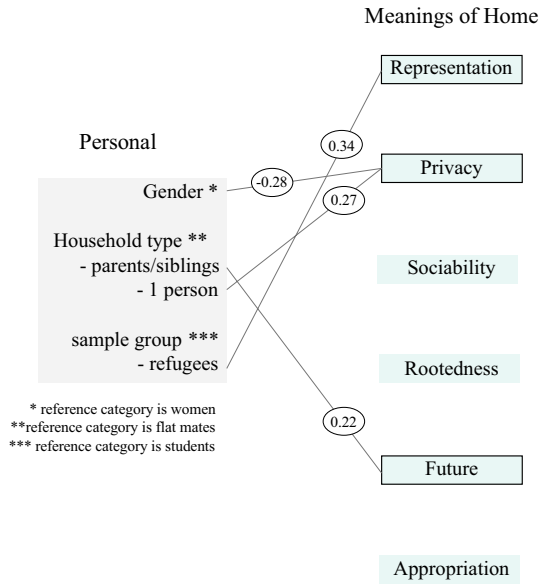
	$R^2$	Representation		Privacy		Sociability		Future		Appropriation		Rootedness	
		$\beta$	$p$	$\beta$	$p$	$\beta$	$p$	$\beta$	$p$	$\beta$	$p$	$\beta$	$p$
Light													
Cooking	0.04	-0.01	0.92	-0.04	0.64	0.10	0.15	0.05	0.50	-0.07	0.36	0.12	0.10
Eating	0.01	0.07	0.34	0.02	0.82	0.06	0.44	-0.04	0.54	0.04	0.60	-0.04	0.59
Studying/ working	0.02	0.06	0.47	0.01	0.86	0.10	0.16	-0.06	0.38	-0.02	0.77	-0.01	0.87
Relaxing	0.01	-0.02	0.79	-0.01	0.89	0.03	0.72	-0.05	0.45	-0.05	0.48	0.03	0.73
Receiving guests	0.10*	-0.18	0.02*	0.11	0.16	0.23	0.00*	-0.07	0.36	-0.14	0.06	-0.03	0.74
Sleeping	0.03	0.11	0.15	-0.07	0.32	0.06	0.42	0.06	0.41	0.09	0.17	0.03	0.68
Showering	0.11*	0.20	.01*	-0.04	0.55	0.00	1.00	0.23	0.00*	0.05	0.41	0.05	0.46
Sound													
Cooking	0.03	0.11	0.17	-0.06	0.47	-0.07	0.35	0.09	0.21	-0.06	0.44	0.00	0.97
Eating	0.03	0.11	0.15	0.00	0.97	-0.10	0.16	0.01	0.87	-0.11	0.12	0.02	0.83
Studying/ working	0.04	0.03	0.72	0.08	0.31	-0.11	0.12	0.10	0.16	-0.10	0.17	0.04	0.57
Relaxing	0.05	0.05	0.47	0.16	0.03*	-0.09	0.19	0.02	0.79	-0.12	0.09	0.03	0.71
Receiving guests	0.04	-0.04	0.59	-0.03	0.69	-0.09	0.24	0.04	0.56	-0.12	0.11	0.11	0.15
Sleeping	0.04	-0.02	0.75	0.08	0.30	-0.08	0.26	0.08	0.28	0.09	0.20	-0.11	0.14
Showering	0.03	-0.04	0.57	0.09	0.21	-0.07	0.36	0.12	0.10	0.01	0.93	0.05	0.53
Cleanliness													
Cooking	0.03	-0.14	0.07	0.09	0.23	0.05	0.47	0.06	0.43	0.01	0.90	0.05	0.49
Eating	0.03	0.05	0.52	0.06	0.39	0.03	0.69	0.05	0.48	0.09	0.19	0.06	0.38
Studying/ working	0.04	-0.10	0.22	0.13	0.10	-0.06	0.41	-0.09	0.21	-0.01	0.88	0.08	0.31
Relaxing	0.08*	0.25	0.00*	0.06	0.43	-0.07	0.32	0.02	0.75	0.05	0.44	-0.02	0.80
Receiving guests	0.03	-0.06	0.47	0.06	0.44	-0.02	0.82	-0.02	0.78	-0.05	0.52	0.14	0.07
Sleeping	0.09*	0.26	0.00*	0.01	0.89	-0.07	0.31	0.10	0.14	0.07	0.32	-0.05	0.47
Showering	0.11*	0.22	0.00*	0.05	0.47	0.00	0.95	0.16	0.02*	0.05	0.49	0.03	0.72
Air													

Table 6 (continued)

	$R^2$	Representation		Privacy		Sociability		Future		Appropriation		Rootedness	
		$\beta$	$p$	$\beta$	$p$	$\beta$	$p$	$\beta$	$p$	$\beta$	$p$	$\beta$	$p$
Cooking	0.02	-0.04	0.59	0.08	0.30	-0.08	0.29	0.04	0.62	0.09	0.20	0.04	0.58
Eating	0.04	0.07	0.38	0.14	0.07	-0.12	0.08	-0.01	0.86	0.03	0.67	0.04	0.58
Studying/ working	0.01	0.04	0.66	-0.02	0.84	0.03	0.71	-0.05	0.54	0.04	0.62	0.02	0.77
Relaxing	0.05	0.12	0.12	0.15	0.05*	-0.06	0.43	0.01	0.94	0.02	0.76	0.03	0.71
Receiving guests	0.03	-0.04	0.59	0.16	0.04*	0.02	0.78	-0.01	0.91	-0.03	0.71	0.02	0.80
Sleeping	0.04	0.05	0.54	0.14	0.07	-0.01	0.85	0.06	0.38	0.06	0.38	0.04	0.56
Showering	0.07*	0.15	0.05	0.07	0.36	-0.05	0.47	0.11	0.10	0.10	0.14	0.01	0.91
Warm													
Cooking	0.01	-0.03	0.72	0.11	0.14	-0.01	0.85	-0.03	0.72	0.04	0.55	-0.02	0.80
Eating	0.01	-0.09	0.24	0.01	0.85	-0.04	0.57	0.00	0.98	-0.01	0.95	0.06	0.39
Studying/ working	0.01	-0.10	0.19	0.04	0.57	-0.06	0.40	0.02	0.77	0.00	0.98	0.03	0.74
Relaxing	0.04	-0.16	0.03*	-0.01	0.86	0.03	0.71	-0.04	0.59	-0.06	0.40	0.08	0.26
Receiving guests	0.05	-0.20	0.01*	0.13	0.10	0.06	0.44	0.02	0.77	-0.06	0.44	0.01	0.88
Sleeping	0.01	0.04	0.56	0.02	0.75	-0.08	0.25	-0.01	0.93	-0.01	0.90	0.00	0.97
Showering	0.03	0.08	0.30	0.07	0.35	-0.04	0.56	0.03	0.64	-0.10	0.15	-0.12	0.10

\*  $p < 0.05$

**Fig. 1** Diagram of the relationships between personal characteristics and meanings of home



**Fig. 2** Diagram of the relationships between meanings of home, activities, and IEQ

## 5.1 Comparing meanings of home

Six factors were found for our sample with students, permit holders, and starters: Representation, privacy, sociability, future, appropriation, and rootedness. The distribution of the items in each of the factors was in line with the literature: Representation included items such as status and values; Csikszentmihalyi and Rochberg-Halton (1981) described that objects in a dwelling can be regarded as representative of the owner's goals, where objects signal status and social hierarchy. Privacy related to items that indicate control (Altman, 1976). Rootedness related more to the perspective of time passing, and links to the body of research on place attachment, where familiarity with the environment plays a role (Twigger-Ross & Uzzell, 1996). On the other hand, 'Future' was a separate factor, indicating that it might be necessary to separate temporal qualities into the past and future.

With a scale for meanings of home it becomes possible to compare groups, such as renters and home-owners (Groves, 1996; Kearns et al., 2010), but also students and permit holders, or simply individuals independent of which group they are. Not all meanings of home might be equally important, also within a group. Being able to make comparisons between dwellers helps with understanding how someone's current situation affects their meanings of home. Knowing how meanings are transferred to the dwelling could be informative when existing housing is assigned or when new housing is designed, either new-built or transformed. This would likely increase satisfaction with the dwelling. Furthermore, this might help identify what could be done to improve temporary housing for students, permit holders, and starters.

### 5.1.1 Sample group

The permit holders valued representation more than the students or starters, although they were also in their twenties and enrolled at a higher education institution. This could be because they have different cultural backgrounds and past experiences. They might feel a stronger wish for their home to show that they are like everyone else, have expectations of the future, and at the same time are trying to distance themselves from their atypical journey to the Netherlands. Caia et al. (2010) found that post-disaster dwellers were more satisfied with their temporary dwelling when it looked like a house rather than a refurbished container. Considering that the permit holders valued representation, they might regard their dwelling more like a home if it looked more like a house.

### 5.1.2 Gender

The women in the sample valued privacy in the home more than men. This could be a result of today's society where women are still treated differently than men and that women retreat to their home to feel safe and in control, either due to specific personal experiences or a more general feeling. Women who were victims of domestic abuse tended to value security and stability in a home (Woodhall-Melnik et al., 2017). This raises the question whether the difference found in this research is due to some women in the sample who experienced domestic abuse or if it is indeed a more general tendency. Considering domestic violence statistics, in high-income countries the prevalence of having experienced some type of domestic violence as a woman, is almost one in four (Javier & Herron, 2018). It is unlikely however, because of its universality, that

the design of a home directly contributes to this number. Nonetheless, the changing position of women in society has led to housing designs with more open spaces (Ozaki, 2003). Still, it is unclear if women use their dwelling differently from men and more research is necessary to understand why these differences in meanings of home appear before design recommendations can be made.

### 5.1.3 Age

Age was not associated with rootedness, which seems counterintuitive. Most of the respondents were aged between 20 and 30, had left their parents' home and found their own place, perhaps placing less importance on rootedness than either younger or older people. Research shows that this age group is focussing on their future life, at least concerning house buying (Feijten et al., 2003), which could explain why rootedness and future are not important; most of them are not rooted nor know where they will be in a few years. Another explanation could be that rootedness is less important when you are aware that housing is temporary; length of residence has been found to predict levels of place attachment (Lewicka, 2011). Dwellings and rental contracts could be designed in such manner that it is not necessary to move out when someone's situation changes, which might make it easier to invest financially, emotionally, or physically, in a dwelling place.

## 5.2 Meanings of home, activities, and IEQ

### 5.2.1 Activities

How the respondents received guests depended on what home meant to someone. Rapoport (1982) theorised based on his and other research that there is more to an activity than the activity itself. This supports the findings from the analyses that sociability and rootedness influenced receiving guests and that preferences for a space varied when different meanings of home were valued. Likewise, it is consistent with research from Rechavi (2009) on the use of living rooms who found that activities that take place there vary in spatial requirements. Additionally, a study on a temporary changeable home for students showed that engaging in social activities can increase a feeling of attachment to the dwelling, even when the stay is temporary (Thomsen & Tjora, 2006). This supports the finding that sociability influences receiving guests, and that the requirements for a space might be different when sociability is important for someone.

Lindberg et al. (1987) found that dwellings were valued more positively if they had attributes that facilitated everyday activities of that person. Increasing the size of a room for example was found to be related to a higher instance of relaxing, inviting friends, and giving parties, leading to happiness, freedom, and togetherness. A space may derive its quality more from how flexible a space is than purely the amount of it. This corresponds with the concept of affordances (as defined by Gibson (2014)), where each person can see different ways of using something depending on who they are, including personality, experiences, and physical characteristics.

Designers could think about how spaces can be arranged so that there is space for different types of activities, especially receiving guests, without interference. This might make dwelling spaces more flexible and thus suitable for more different people.

### 5.2.2 IEQ

Some activities in the home, such as cooking, affect the indoor environmental quality more than others. Depending on how these activities are ideally carried out, the ideal indoor environmental qualities can vary. However, our research did not find significant differences for eating and cooking, although these were expected (Daniels et al., 2012; Wolfson et al., 2016). Further research with more detailed questions on IEQ for cooking and eating or a more varied sample might explain these findings.

Key differences for this sample in what a home means for someone and how he or she would use it, were found for both cleanliness and light, for receiving guests, sleeping, relaxing, and taking a shower or bath, and the factor of representation. Sound and thermal aspects may not be as noticeable as cleanliness and light and, therefore, might not have shown any significant differences in preferences for an activity, depending on the meaning of home. For which activities this was the case seemed to depend on what residents want others to see, also in spaces not usually visited by guests. Another possibility is that differences in preferences for sound, air and thermal aspects were influenced by other factors (Bluyssen, 2020) that we did not ask about.

Harris and Sachau (2016) found that cleanliness was linked to the personality trait ‘openness’ and is used to form an impression of a person. This raises the question whether people living in ‘cleaner’ dwellings are more open, or if they are only perceived that way. Perhaps the visitor feels more welcome when there are fewer personal traces in the dwelling. More options for how to light spaces and to store or display possessions could be considered to improve the design of temporary dwellings.

## 5.3 Strengths and limitations

This study was the first that measured differences in meanings of home and related these to home-activities and IEQ preferences. There were significant but limited relationships found between meanings of home, household characteristics, activities, and preferences for IEQ. Practical improvements would be to have a larger sample and more similar group sizes, and to test all relationships at the same time with Structural Equation Modelling. Additionally, the number of items in the factors future, appropriation, and rootedness could be increased to improve internal validity, because they only consisted of two or four items (Tabachnick & Fidell, 2013). Another improvement would be to include more personal factors, for instance current and past experiences of a home environment, because they can affect one’s meaning of home (Darrah & DeLuca, 2014) and what is preferred (Wolbring, 2016).

Using vacant buildings for (temporary) housing in Europe could decrease housing provision problems such as available land, neighbours opposing new developments, and the speed of building. Whether this can be a long-term solution might depend on the quality of the housing and on if there are any consequences for the temporary residents, for example the feeling of being in between dwelling places, less opportunities to invest, or less attachment to the neighbourhood. Additionally, this research only included residents in the Netherlands and there could be differences between countries, especially considering culture and preferred IEQ.

Summarising, the scale developed in this study to measure meanings of home should be tested with a wider age range and other housing situations to further explore the scale and its consistency.

## 6 Conclusions

Currently, designers and planners of housing in transformed buildings are unaware of how meanings of home affect how students, permit holders, and starters on the housing market, want to use that dwelling. This study investigated how students', permit holders', and starters' meanings of home are related to which activities are performed and what preferences they have for IEQ.

For our sample, meanings of home were categorised into six factors: Representation, privacy, sociability, future, appropriation, and rootedness. Household characteristics slightly influenced how much each of these factors was valued; representation was valued more by refugees, privacy more by women and respondents who lived alone, and future more by respondents who lived with parents/siblings and by permit holders. The factors also influenced how much light and cleanliness the respondents preferred for relaxing, receiving guests, and taking a bath or shower. Differences between the sample groups were significant, but minimal. Therefore, thinking of designing an apartment for one group, such as students or refugees, might not be the best approach. Home could mean different things within that group and thus require different designs; it could be a shelter, a space to socialise or be alone, or a representation of one's identity and ideas about the future. Specifically, relaxing and receiving guests were affected by meanings of home, and these deserve more attention in the design and policy process. For example, in a studio apartment, space that could function as either storage or additional seating would be recommended to accommodate multiple and flexible uses as admittedly, not all students, all permit holders, or all starters, will have the same needs and desires. The measurement of meanings of home we created could be useful to formulate design recommendations for different user groups than the ones we investigated, and further testing on all groups could make it more universally applicable. However, despite our limited sample we were able to specify which aspects of home design need more attention to make a temporary dwelling more like home.

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## Declarations

**Conflicts of interest** There are no conflict of interest

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