Wellbeing, Space and Society 11 (2026) 100429

Contents lists available at ScienceDirect

Wellbeing, Space and Society

journal homepage: www.sciencedirect.com/journal/wellbeing-space-and-society

Dimensions of housing – Influence of per-person living space and occupancy density on housing satisfaction and residential satisfaction: A scoping review

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ARTICLE INFO

Keywords:
Crowding
Housing satisfaction
Living space
Occupancy density
Persons per room
Regression models
Research methods
Residential satisfaction
Living space per capita

ABSTRACT

Introduction: Satisfaction with the living environment is shaped by cultural and contextual factors. While "adequate space" is normatively and politically defined, the link between living space, occupancy density, and subjective satisfaction is often assumed but rarely systematically studied. Considering climate goals and rising living space per capita, this relationship is increasingly relevant.
Objective: The aim of this study was to investigate the relationship between per-person living space (measured in square meters or in number of [bed]rooms) and housing or residential satisfaction, and to identify influencing or moderating factors.
Method: The study was conducted as a scoping review. A systematic literature search identified empirical studies on the general population that statistically examined this relationship. Institutional housing (e.g., care homes, student residences) was excluded. Data extraction followed a standardized, iterative procedure.
Results: 18 studies were included, some with subgroup analyses, resulting in 26 entries. Most studies used standardized primary data; others analyzed large household surveys. Satisfaction (dependent variable) was measured using Likert scales. Living space per person, persons per [bed]room, or number of [bed]rooms served as explanatory variables, alongside individual, housing-, and neighborhood-related factors. Analyses were conducted using regression models.
Discussion: A predominantly positive correlation was found between living space/[bed]rooms per person and satisfaction. However, the results showed context-specific variation and considerable heterogeneity in concepts, measurement tools, and modeling approaches.
Conclusions: Per-person living space and occupancy density are relevant, though not exclusive, predictors of satisfaction. The findings highlight the need for clearer definitions, consistent indicators, and standardized measurement to enhance cross-study comparability.

1. Introduction

In view of the advancing climate crisis and growing demands for a resource-conserving lifestyle, questions about the sustainable use of living space are becoming increasingly relevant, especially in light of evidence that growth in floor area per capita can offset efficiency gains

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https://doi.org/10.1016/j.wss.2026.100429

Available online 10 June 2026
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in the buildings sector (Cabeza et al., 2022; IPCC, 2023). In 2022, direct and indirect CO_2 emissions from building operations amounted to nearly 9.8 Gt worldwide (IEA, 2023a). Residential buildings accounted for 6.1 Gt CO_2 of this total, whereas non-residential buildings accounted for 3.7 Gt CO_2 (IEA, 2023a). Beyond operational emissions, another 2.5 Gt CO_2 were associated with building construction, including embodied emissions from materials such as cement, steel, and aluminum (IEA, 2023b). In the IPCC assessment, residential buildings contributed 50% of global building-related CO_2 emissions in 2019 (Cabeza et al., 2022). Thus, increasing living space is associated not only with greater material demand in the construction phase, but also with higher energy demand in the use phase, especially for heating, cooling, lighting, and other building energy services such as ventilation (Cabeza et al., 2022; IEA, 2020). Against this background, living space per capita is increasingly discussed as a key lever for climate mitigation in the housing sector, alongside technical efficiency measures, especially as average floor area per person continues to rise globally (Cabeza et al., 2022; Ellsworth-Krebs, 2020; IEA, 2022; Mastrucci et al., 2025). Internationally, however, there is considerable inequality in the distribution of living space both between and within countries. While some regions fail to meet minimum standards of human dignity, excessive land consumption is widespread in more affluent contexts (Lamb et al., 2021; UN-Habitat, 2022).

Sufficiency measures – such as space optimization, sharing concepts, or adjusting housing size to household needs – aim to achieve both ecological and social goals. In this context, sufficiency refers to reducing demand for living space and the associated use of materials and energy where these exceed what is required to meet basic housing needs and decent living standards (Arceo et al., 2025; Bohnenberger, 2021; Cabeza et al., 2022; Ruokamo et al., 2024; Sandberg, 2021). This creates an inherent tension: reducing private living space is not only seen as an ecological measure, but also as a possible invasion of personal freedom of choice and action (Lage, 2025; Lehner et al., 2024). In addition, empirical evidence generally indicates that larger living space or lower occupancy density correlates with greater satisfaction with housing (Chen et al., 2023; Foye, 2017). Against this backdrop, the question arises as to what extent measures to reduce living space could conflict with individual needs for space.

What counts as "adequate living space" cannot be defined by a single universal threshold, but depends on cultural, social, and political circumstances (UN-Habitat, 2014). This context dependence is also reflected in international housing policy. In 1996, the United Nations Conference on Human Settlements (Habitat II) declared adequate housing to be a fundamental human right. The resulting Habitat Agenda has since been regarded as the key international reference document for sustainable and socially just housing policy. It describes adequate housing as follows:

"Adequate shelter means more than a roof over one's head. It also means adequate privacy; adequate space; physical accessibility; adequate security; security of tenure; structural stability and durability; adequate lighting, heating, and ventilation; adequate basic infrastructure, such as water supply, sanitation, and waste management facilities; suitable environmental quality and health-related factors; and adequate and accessible location with regard to work and basic facilities: all of which should be available at an affordable cost" (United Nations, 1996).

A key aspect of adequate housing conditions is therefore the availability of adequate living space (United Nations, 1996). If living space is not sufficient in relation to the size of the household, the situation is referred to as overcrowding (WHO, 2018) – a condition that has been shown to be associated with physical and psychological stress (Gove et al., 1983; Evans, 2003). Due to the varying assessments of housing adequacy, the WHO recommends the context-sensitive definition of national thresholds for overcrowding (WHO, 2018). Three indicators have become internationally established: persons per room, persons per bedroom, and available living space per person (e.g., square footage or square meters per person, living space per capita) (HUD, 2007). In addition to the chosen metric, the definition of what constitutes a "room" also varies internationally. While in Europe, for example, the kitchen is usually not considered a room, in other regions it may be counted if it meets certain minimum criteria (OECD, 2024; United Nations, 2017).

These differences are also reflected in national standards and thresholds. In the United States, overcrowding is commonly defined as more than one person per room, with severe overcrowding assumed above 1.5 persons per room (U.S. Census Bureau, 2021). In Argentina, by contrast, "critical overcrowding" is defined as more than three persons per room (INDEC, n.d.). Within Europe, Eurostat and the OECD use a needs-based room standard rather than a fixed persons-per-room ratio. Under this approach, the required number of rooms depends on household composition, for example whether household members are couples, single adults, or children of different ages and sexes (Eurostat, n.d.; OECD, 2024). Differences are also visible in floor-area standards: in Germany, lower thresholds of 9 m^2 per adult and 6 m^2 per child under six are often used (Deutscher Bundestag, 2017; 2022), whereas in Japan a minimum standard of 25 m^2 is recommended for a single-person household, with higher benchmark values depending on household size and housing type (MLIT, n.d.). A detailed description of national standards and thresholds can be found in Appendix A.

Taken together, these examples show that the amount of living space available per person is not a simple or universally defined measure, but a complex and multidimensional construct shaped by numerous sociodemographic, housing-related, and environmental factors (Lu, 1999). A systematic analysis of existing modeling approaches by Mridha (2023) shows that recurring influencing factors can be identified in the literature, including individual characteristics (e.g., income, education, or household structure), physical characteristics of the home (e.g., size, condition, ventilation), characteristics of the environment and neighborhood (e.g., infrastructure, safety, social relationships), and institutional organizational aspects such as satisfaction with housing management, the quality of housing-related services, and the extent of opportunities for participation in the living environment. These factors do not act in isolation, but unfold their effect in conjunction with subjective perceptions, expectations, and evaluations. Thus, identical living conditions can be experienced differently by different people, depending, for example, on their need for control, social integration, or self-efficacy (Canter and Rees, 1982; Francescato et al., 1979).

In addition, the weighting and impact of individual influencing factors can vary greatly between cultures and regions. The OECD (2025) points out that there are different normative ideas across countries about which characteristics are considered indicators of good housing quality. Curtis and Riva (2023) emphasize that subjective assessments can vary considerably globally even when objective housing conditions are comparable. Taken together, these observations suggest that cultural, social, and political contexts shape not only what is considered adequate living space, but also how identical or similar space-related housing conditions are perceived and evaluated. As a result, the relationship between living space and housing/residential satisfaction cannot be assumed to be uniform across settings.

Self-report instruments are predominantly used for empirical surveys of housing satisfaction and residential satisfaction. These range from simple questions on general satisfaction to multidimensional scales that capture various aspects such as location, amenities, or social integration (Smrke et al., 2018). However, a systematic review by Smrke et al. (2018) shows that many of these instruments are not sufficiently methodologically sound: information on theoretical derivation, scale development, or psychometric quality is often lacking (ibid.). Standardized and validated survey instruments are rare, which makes it difficult to compare studies. In addition, many questionnaires are developed ad hoc and without transparent documentation. An example of a conceptually sound approach is the integrated model by Weidemann and Anderson (1985), which considers affective, cognitive, intentional, and behavioral components and describes the interactions between

individual characteristics and environmental conditions in a multidirectional context. Although this model has not yet been widely used, it illustrates how a theory-driven and multidimensional assessment can be designed.

In general, housing satisfaction refers more narrowly to the evaluation of dwelling-related characteristics such as size, layout, or amenities (Lu, 1999; Weidemann and Anderson, 1985), whereas residential satisfaction may extend beyond the dwelling itself to include social, economic, and neighborhood-related dimensions (Amérigo and Aragonés, 1997; Clapham et al., 2017; Mridha, 2023). In empirical research, both constructs are typically measured using self-report instruments, ranging from single-item questions to multidimensional scales (Smrke et al., 2018). However, the distinction between housing satisfaction and residential satisfaction is not always applied consistently, which complicates comparison across studies. Because the distinction between housing satisfaction and residential satisfaction is not applied consistently in the empirical literature, and because the present review focuses on dwelling-related indicators that are examined in relation to both outcomes, both constructs were considered.

Broader review work has already shown that housing/residential satisfaction constitutes a conceptually and methodologically diverse field of research. Biswas et al. (2021), for example, mapped the emergence of residential satisfaction studies bibliometrically and highlighted the thematic breadth of the field, while Emami and Sadeghlou (2021) reviewed key theories, determinants, and indicators of residential satisfaction. However, these reviews did not specifically synthesize empirical evidence on the relationship between per-person living space or occupancy density and housing/residential satisfaction, which is the focus of the present scoping review.

Despite these broader conceptual and empirical approaches, there remains a considerable degree of conceptual and methodological heterogeneity in research on the relationship between per-person living space or occupancy density and housing/residential satisfaction. Different units of measurement such as square meters, number of rooms or bedrooms (Freeman and Manturuk, 2019; Solari and Mare, 2012; Wang and Liu, 2023), diverging thresholds for defining minimum standards (Appolloni and D'Alessandro, 2021), varying theoretical models (Mridha, 2023), and inconsistent survey instruments and analysis methods (Lu, 1999; Smrke et al., 2018) make systematic comparison and reliable conclusions difficult. Thus, the question arises as to how meaningful the current evidence on the relationship between per-person living space or occupancy density and housing/residential satisfaction actually is and which contextual conditions or third variables moderate this relationship.

To establish a solid foundation for discussing sufficiency and the definition of adequate shelter within the framework of social housing policy, a structured overview of the existing empirical research on the relationship between per-person living space or occupancy density and subjective housing/residential satisfaction is needed. A preliminary search in Medline, the Cochrane Database of Systematic Reviews, and JBI Evidence Synthesis indicated that there are currently no recent or ongoing systematic reviews or scoping reviews on this topic. Against this background, a scoping review was considered the most appropriate approach for the present study. Given the conceptual and methodological heterogeneity of the existing literature, the aim was not to derive pooled quantitative estimates or direct policy recommendations, but to map the available empirical evidence, compile key findings on the relationship under study, identify relevant contextual influencing factors, and record the measures, theoretical models, survey instruments, and methodological approaches used in previous research. In this way, the review seeks to identify key areas of research and existing gaps, thereby contributing both to the scientific foundation for further research and to the empirical basis of future housing policy debates, for example in relation to minimum standards, housing subsidies, or housing assessment in a social context. This rationale is consistent with Grant and Booth (2009), who describe scoping reviews as a suitable format for providing a preliminary assessment of the size, scope, nature, and extent of an evidence base in heterogeneous fields.

Against this background, the present scoping review addresses the following research questions:

1. To what extent is there empirically grounded evidence of a relationship between per-person living space and/or occupancy density and subjective housing/residential satisfaction?
2. Which contextual, social, or methodological factors influence this relationship?

2. Method

This review was conducted in accordance with the JBI methodology for scoping reviews (Peters et al., 2020) and based on an a priori protocol (Nebel et al., 2024). The protocol specified the review objective, the PCC-based eligibility framework, the search approach, the screening procedure, and preliminary data charting categories, and thus served as the methodological basis for the conduct of the review. Deviations from the protocol are presented and justified in the review at the respective points. In line with the JBI methodology for scoping reviews, the purpose of this review was to map and characterize the available evidence rather than to conduct a formal critical appraisal of study quality. Accordingly, no standardized quality assessment was used as an inclusion or exclusion criterion, and studies were selected on the basis of the predefined eligibility criteria rather than methodological quality ratings. To strengthen transparency and reduce the risk of selection bias, the review was guided by an a priori protocol, based on explicitly defined eligibility criteria, and deviations from the protocol were documented at the relevant points. In addition, data charting conducted by the primary reviewer was checked by a second reviewer against the original full texts.

2.1. Search strategy

The aim of the search strategy was to identify peer-reviewed original studies. The protocol (Nebel et al., 2024) originally envisaged the inclusion of secondary sources and gray literature. However, during the refinement of the review strategy, the focus was restricted to peer-reviewed original empirical studies. This reflects the aim of the

Table 1
Search settings.

Feeling	(Per-person) living space	Living
wellbeing / well being / well-being[1]	square metres / square meters	living
satisfaction / satisfied	square feet / square foot	house / housing
happiness / happy*	size	flat
mental health*	space	apartment
	crowding / overcrowding	residential / residence
	number	rooms / bedrooms / bathrooms
		home

Note: [1]Terms that were only included in the database search on March 9, 2024.

review to examine the underlying empirical evidence on the association between living space-related indicators and housing/residential satisfaction at the level of original studies. To address this question, eligible studies were required to report their own empirical analyses and regression-based effect estimates rather than secondary summaries or interpretations of existing research. Gray literature was not systematically included in the final review process, as the review was deliberately focused on peer-reviewed original empirical studies and followed a clearly defined and transparent search and selection strategy. First, a limited preliminary search was conducted in Web of Science to identify relevant terms from the titles and abstracts of relevant articles. The terms identified were assigned to three thematic areas: (1) feeling, (2) per-person living space, and (3) type of living (Table 1). On this basis, two search strings were formed: The first comprised exclusively terms from the subject area of feeling, which were combined using the Boolean operator OR and applied to the title search. The second contained terms from the subject areas of "(per-person) living space" and "living" and used the OR operator and proximity operators to target hits in titles and abstracts (Table 2). The latter were used to link thematically related terms more precisely. Their syntax varied depending on the database: NEAR/n (e.g., in Web of Science), W/n (Scopus), ADJn (OVID Medline), and N3 (PsycINFO via EBSCO). The search strings were adjusted accordingly.

Following the exploratory search to develop and refine the search terms and search strings, a systematic search was conducted on March 9, 2024, in six databases: Web of Science Core Collection, Scopus, APA PsycInfo 1806 to Present, OVID Medline® All, Art & Architecture Source (via EBSCOhost), and Avery Index to Architectural Periodicals (via EBSCOhost). To supplement this, on October 4 and 5, 2024, the references of the two scoping reviews and the two systematic reviews identified in the search were manually checked for additional relevant sources. In addition, on January 17, 2025, a supplementary review of the bibliographies of all included studies was conducted. An updated database search was conducted on February 16, 2025. In contrast to the first search, only the root word "satisf" was used in the topic area "feeling", as the hits previously obtained had proven to be too heterogeneous in terms of topic and too unfocused in terms of content. This deviation from the a priori protocol (Nebel et al., 2024) was decided unanimously by the research team. The search strategies for the databases are listed in Appendix B.

2.2. Source selection

After completing the literature search, all identified sources were imported into Rayyan, a web-based tool for systematic literature selection, and duplicates were removed. The remaining hits were first reviewed by two independent reviewers at the title and abstract level regarding the inclusion and exclusion criteria. During the screening and selection process, individual criteria were refined or adjusted. Therefore, the version documented in the a priori protocol (Nebel et al., 2024) does not correspond in all aspects to the criteria catalog ultimately applied. All potentially relevant sources were transferred to Citavi Web, where the corresponding full texts were linked and reviewed by both reviewers. Studies that did not meet the inclusion criteria were excluded.

Table 2
Search strings.

No.	Search field	Search string
#1	Title (09.03.2024)	wellbeing OR well-being OR "well being" OR satisf* OR happiness OR happy OR "mental health"
#1	Title (16.02.2025)	satisf*
#2	Title OR Abstract	("square metres" OR "square meters" OR "square foot" OR "square feet" OR size OR space) NEAR/5 (living OR room OR hous* OR home* OR flat* OR apartment* OR residen*)) OR (number NEAR/3 (rooms OR bedrooms OR bathrooms)) OR overcrowding OR crowding)
#3		#1 AND #2

2.3. Inclusion and exclusion criteria

The review focused on studies examining housing satisfaction or residential satisfaction in the general population. To address the review question in a methodologically consistent way, only quantitative empirical studies using regression-based methods to estimate the association between living space-related indicators (e.g., square meters per person, number of rooms) and housing or residential satisfaction were included. This decision was based on the review's aim to synthesize studies that examined these associations while accounting for additional variables included in the respective models. Regression-based analyses were therefore considered particularly suitable, as they provide interpretable effect estimates for the indicators of interest and allow a more differentiated assessment than purely descriptive statistics, bivariate correlations, or group comparisons. Eligible studies had to report original empirical analyses based on primary data or on pre-existing datasets and provide sufficient methodological transparency regarding sample, variables, and analytical approach. Studies were excluded if they did not examine housing or residential satisfaction, did not include living-space-

Table 3
Inclusion and exclusion criteria.

	Inclusion	Exclusion
Population (target group)	Studies focusing on the general population without restrictions based on socioeconomic or demographic status	Animal studies and studies that exclusively focus on individuals with severe mental illness
Concept (outcome of interest)	Studies examining outcomes related to housing or residential satisfaction	Studies that do not focus on housing or residential satisfaction
Concept (analytical approach)	Studies using regression models to estimate the effect of living space (e.g., number of rooms, square meters per person) on housing or residential satisfaction	Studies that report only bivariate associations or group differences (e.g., Pearson's r, *t*-tests, ANOVA) or descriptive statistics, without providing regression-based effect estimates (standardized or non-standardized coefficients) for living space-related indicators
Concept (indicator of living space)	Studies indicating the available space per person (e.g., square meters, number of rooms) or a corresponding threshold value	Studies that do not contain information on the available space per person (e.g., square meters, number of rooms) or a corresponding threshold value
Context (study setting)	Studies focusing on general housing settings	Studies focusing on specialized housing types (e.g., refugee shelters, homeless shelters, temporary work accommodation, student residences or care homes, assisted living
Geographical focus	No geographical restrictions applied.	–
Publication date	Studies are included regardless of publication date	–
Publication type (study design/ data type)	Studies involving empirical analyses based on original primary data or on pre-existing datasets (e.g., large-scale household surveys), provided that the study authors conducted their own statistical analyses (regression models).	Studies that do not report original empirical data (e.g., systematic reviews, scoping reviews, meta-analyses) or that are not peer-reviewed (e.g., dissertations, conference proceedings, editorials, commentaries, book chapters, correspondence, or short communications)
Language	Studies published in English	–

related indicators, relied exclusively on descriptive statistics, group comparisons, or bivariate associations, or focused on specialized housing settings. A complete overview of the inclusion and exclusion criteria can be found in Table 3.

2.4. Data extraction (Data charting)

Structured data mapping, understood in the JBI methodology as the systematic compilation of relevant information (JBI, 2024), was initially carried out by the primary reviewer based on the studies included in the scoping review. Subsequently, all entries were checked by the second reviewer against the original data in the respective full texts. The mapping was based on a preliminary tabular form. The categories contained therein were based on the parameters specified in the a priori protocol (Nebel et al., 2024) but were iteratively expanded and refined by the research team during the project to better reflect the specific content of the included studies.

2.5. Data processing and analysis

2.5.1. Data charting, categorization, and harmonization

The extracted data were charted in tabular form (Nebel et al., 2025) and organized according to the central questions of this scoping review. The charting table included information on study characteristics, population, housing situation (e.g., household size, house/flat size, number of rooms/bedrooms, living space per capita, and persons per room/-bedroom), dependent variables (e.g. housing satisfaction, residential satisfaction), regression models, effect sizes, independent variables, key findings, and reported limitations. Data on the number of bathrooms, persons per bathroom, and bathrooms per person were also documented during charting but were not included in the analysis, as they were considered to reflect comfort or prosperity rather than available living space.

Since the selection, number, and categorization of explanatory variables for housing satisfaction and residential satisfaction differed considerably between studies, an additional categorization step was performed. The aim was to systematically record the dimensions of housing/residential satisfaction modeled in the primary studies and to present them in a comparable manner in terms of their content breadth. Only those variables that were ultimately included in the multiple regression models to explain housing/residential satisfaction were considered. Influencing factors that were only discussed theoretically or presented descriptively were not considered. Each factor that could be distinguished in terms of content was counted as one variable – even if it was operationalized in the primary studies by several dummy variables (e.g., age groups or types of housing) (Ahn and Lee, 2016; Baiden et al., 2011; Foye, 2017; Freeman and Manturuk, 2019; Galster, 1987; Huang and Du, 2015a; Nguyen et al., 2017, 2019; Salas and Vigorito, 2019; Tao et al., 2014). This approach was intended to prevent studies with more differentiated variable structures from being assigned a disproportionate number of individual variables.

The category scheme developed for this review was based on the structural intersections of the groupings used in the primary studies. The variables were assigned to three overarching analytical dimensions: (1) individual and household-related characteristics, (2) dwelling and housing-related characteristics, and (3) neighborhood and environmental characteristics.

To evaluate the relationship between floor area, occupancy density, and housing/residential satisfaction, the indicators used in the primary studies were harmonized without recoding their substantive meaning. Of particular interest for the present analysis were per-person indicators such as living space per capita and persons per [bed]room. Where these indicators were not reported directly, they were derived mathematically from other reported variables where possible (e.g., total floor area and household size). When the relevant information was available only in categorized or interval-based form, approximate values were determined using arithmetic means or, where appropriate, weighted means. For example, interval classes such as 61–80 m^2 for floor area (Li et al., 2019; Pongpraesert and Chatrkaw, 2023) or 3–4 persons for household size (Azimi and Esmaeilzadeh, 2017; Huang and Du, 2015a; Ibem et al., 2019; Li et al., 2019; Pongpraesert and Chatrkaw, 2023) were converted into approximate values. For open categories, conservative estimates were applied based on plausible assumptions (Huang and Du, 2015a; Ibem et al., 2019; Li et al., 2019; Pongpraesert and Chatrkaw, 2023).

To enable a comparative analysis of satisfaction scores, all reported scales were standardized to a uniform range from 0 to 1 using a linear min–max transformation: *Standardized score = (original value − minimum value of the scale) / (maximum value − minimum value)*

2.5.2. Analysis addressing research question 1

Bivariate regression analyses were performed to examine the relationship between per-person living space or occupancy density and the reported satisfaction scores. Standardized satisfaction scores (0–1) were used as the dependent variable and compared with indicators for living space per person, persons per room, and persons per bedroom. The correlations were visualized using scatter plots in which the individual study values were represented as points. In addition, a regression line was drawn in each plot to show the general trend.

Regression parameters available from the primary studies were extracted for the systematic recording of statistical correlations between per-person living space or occupancy density and housing/residential satisfaction. Both non-standardized and standardized regression coefficients, as well as odds ratios, were considered. The latter were derived mathematically from B values ($OR = e^B$) where necessary. The selection was made based on the relevance of the living space indicators for the research question. The aim was to make the effect directions comparable and to create a structured basis for the content-related synthesis of the findings.

2.5.3. Analysis addressing research question 2

To analyze possible factors influencing the relationship between living space indicators and housing/residential satisfaction, stepwise regression models of the primary studies were used. The aim was to examine whether additional covariates – such as individual, housing-related, or contextual characteristics – increase the explained variance and alter the relationship between living space or occupancy density and satisfaction. To this end, the reported model stages were compared, particularly regarding the development of effect sizes and [pseudo]R^2 values. It was considered whether the effect of the living space indicator remained stable or changed significantly when other variables were controlled for.

In addition, a systematic evaluation of all final regression models in which a significant correlation between living space indicators and residential satisfaction was reported was carried out to further address the second research question. All additional covariates with a significant influence were extracted from these models. The variables were then assigned to three analytical categories: (1) individual and household-related characteristics, (2) dwelling and housing-related characteristics, and (3) neighborhood and environmental characteristics. The aim was to gain a systematic overview of relevant influencing factors beyond quantitative living space indicators – without evaluating the model quality or the strength of individual effects.

As a supplementary approach to identifying possible factors influencing the relationship between living space indicators and housing/residential satisfaction, subgroup analyses reported in several of the included studies were evaluated. The aim was to identify possible differences between different population groups and contexts.

2.6. Reviewer consensus and methodological support

The entire methodological process – from the development of the

search strategy to screening and data mapping – was supervised by the University Library Zurich. Any discrepancies between the reviewers during the various phases of the selection and extraction process were resolved by consensus.

3. Results

3.1. Source inclusion

As part of the systematic database search, 2925 records were initially identified. After removing 1327 duplicates, 1598 records remained, which were screened at the title and abstract level. Of these, 1429 records were excluded based on the above criteria. The full text was obtained for 169 records, but five studies were not accessible. A total of 164 full texts were thus reviewed for suitability, of which 154 were excluded. In addition to the database search, 136 further records were identified by evaluating the references of relevant works. After removing 44 duplicates (hits that had already been captured by the previous database search), 92 records remained, which were checked based on their titles and abstracts. This resulted in the exclusion of 18 records. Full texts were sought for the remaining 74 records; full text access was not possible for seven studies. The 67 full texts available were then reviewed for suitability, resulting in the exclusion of 59 studies. Appendix C provides full documentation of the excluded studies, including the applicable exclusion criteria. Ultimately, 18 studies were included in the evaluation. Fig. 1 shows a flow diagram in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) (Page et al., 2021), which illustrates the entire selection and inclusion process. If studies met multiple reasons for exclusion, only one reason was indicated in the flow diagram. Appendix G contains supplementary flow diagrams for all individual steps of the literature search, which provide detailed information on the process.

3.2. Characteristics of included sources

A total of 18 studies were included in the final analysis. Two author groups are represented with two independent studies each (Huang and Du, 2015a; Huang et al., 2015b; Nguyen et al., 2017, 2019). Some of the 18 studies included (n = 4; 22.2%) differentiated between specific subgroups within their analyses (Azimi and Esmaeilzadeh, 2017; Foye, 2017; Freeman and Manturuk, 2019; Huang and Du, 2015a), which is why they were represented by multiple entries in the data extraction table (Nebel et al., 2025). For this reason, the data extraction table contains 26 entries.

The included studies were published between 1987 and 2023. The majority were published after 2015 (n = 14; 77.8%) (Ahn and Lee, 2016; Azimi and Esmaeilzadeh, 2017; Foye, 2017; Freeman and Manturuk, 2019; Huang and Du, 2015a; Huang et al., 2015b; Ibem et al., 2019; Lee et al., 2021; Li et al., 2019; Nguyen et al., 2017, 2019; Pongpraesert and Chatrkaw, 2023; Salas and Vigorito, 2019; Zeng et al., 2020). The most frequently represented year was 2019 (n = 5; 27.8%) (Freeman and Manturuk, 2019; Ibem et al., 2019; Li et al., 2019; Nguyen et al., 2019; Salas and Vigorito, 2019), followed by 2017 (n = 3; 16.7%) (Azimi and Esmaeilzadeh, 2017; Foye, 2017; Nguyen et al., 2017) and the years 2014 (Noor et al., 2014; Tao et al., 2014) and 2015 (Huang and Du, 2015a; Huang et al., 2015b) (n = 2; 11.1% each). One study each (5.6%) was published in 1987 (Galster, 1987), 2011 (Baiden et al., 2011), 2016 (Ahn and Lee, 2016), 2020 (Zeng et al., 2020), 2021 (Lee et al., 2021), and 2023 (Pongpraesert and Chatrkaw, 2023).

All included studies were published in English. More than half of the studies (n = 10; 55.6%) were conducted in Asia (Azimi and Esmaeilzadeh, 2017; Huang and Du, 2015a; Huang et al., 2015b; Li et al., 2019; Nguyen et al., 2017, 2019; Noor et al., 2014; Pongpraesert and Chatrkaw, 2023; Tao et al., 2014; Zeng et al., 2020). There is a regional focus on East and Southeast Asia, with studies from China (n = 5; 27.8%) (Huang and Du, 2015a; Huang et al., 2015b; Li

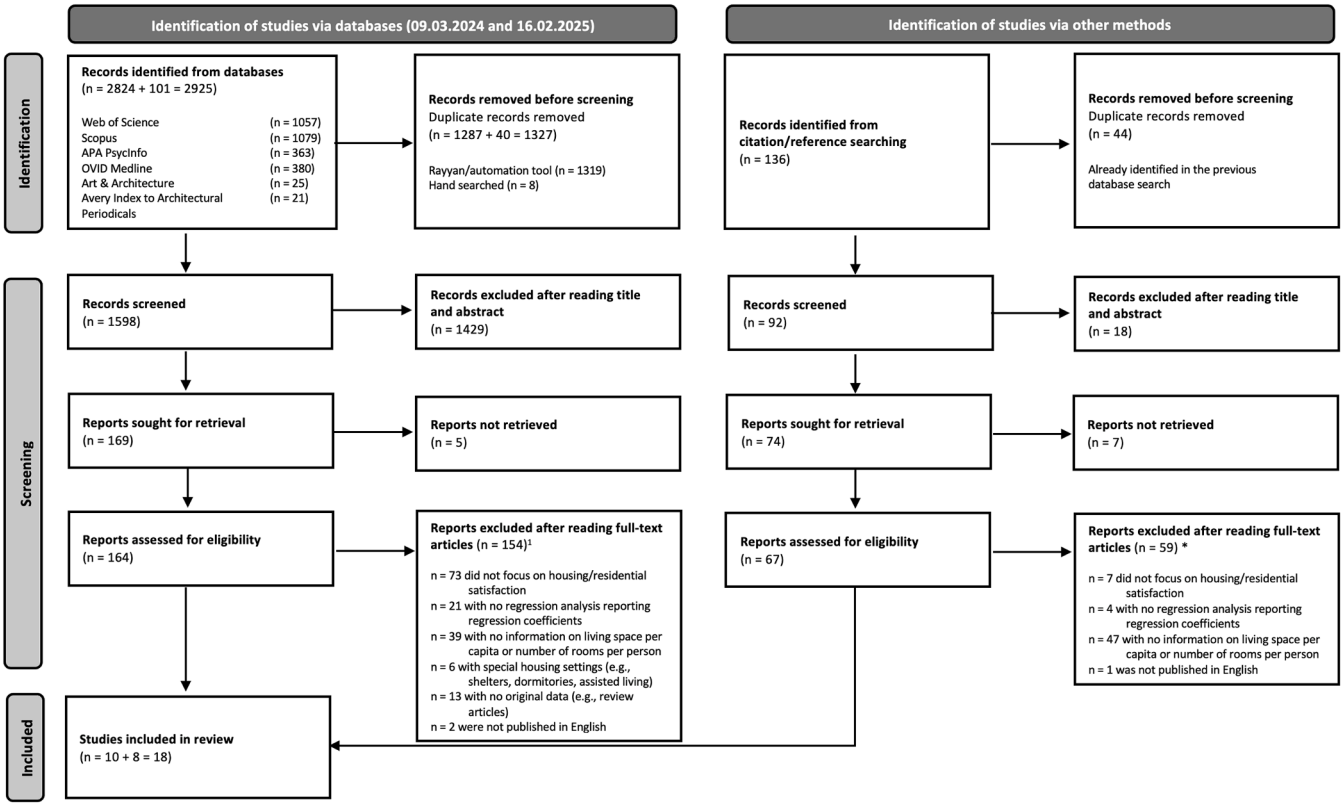


Fig. 1. PRISMA flow diagram of study selection and identification (Page et al., 2021).
Note. [1] Some studies met more than one exclusion criterion. For clarity, the simplified version is shown here; a full list is available in the appendix.

et al., 2019; Tao et al., 2014; Zeng et al., 2020), Vietnam (n = 2; 11.1%) (Nguyen et al., 2017, 2019), Malaysia (n = 1; 5.6%) (Noor et al., 2014), and Thailand (n = 1; 5.6%) (Pongpraesert and Chatrkaw, 2023). Another study comes from West Asia (Middle East), specifically Iran (5.6%) (Azimi and Esmaeilzadeh, 2017). The American continents were represented by a total of five studies (27.8%) (Ahn and Lee, 2016; Freeman and Manturuk, 2019; Galster, 1987; Lee et al., 2021; Salas and Vigorito, 2019), four of which were from the USA (North America) (Ahn and Lee, 2016; Freeman and Manturuk, 2019; Galster, 1987; Lee et al., 2021) and one from Uruguay (South America) (Salas and Vigorito, 2019). Two studies (11.1%) originated from African countries – Ghana (Baiden et al., 2011) and Nigeria (Ibem et al., 2019). Another study was conducted in Europe, in England (5.6%) (Foye, 2017).

The included studies are all based on quantitative survey designs. Four studies (22.2%) are based on analyses of existing household surveys, including the American Housing Survey (AHS) (Ahn and Lee, 2016), the British Household Panel Survey (BHPS) (Foye, 2017), the Community Advantage Panel Study (CAPS) (Freeman and Manturuk, 2019), and the Estudio Longitudinal del Bienestar en Uruguay (Salas and Vigorito, 2019). Nine studies (50.0%) conducted face-to-face interviews with household members (Azimi and Esmaeilzadeh, 2017; Baiden et al., 2011; Galster, 1987; Lee et al., 2021; Li et al., 2019; Nguyen et al., 2017, 2019; Noor et al., 2014; Tao et al., 2014). The remaining studies (n = 5; 27.8%) used standardized questionnaires whose survey mode was either not specified in detail or included several options (e.g., online or face-to-face, or online or on-site) (Huang and Du, 2015a; Huang et al., 2015b; Ibem et al., 2019; Pongpraesert and Chatrkaw, 2023; Zeng et al., 2020).

Considering the subgroup analyses, sample sizes varied between 88 (Huang and Du, 2015a) and 5862 individuals (Foye, 2017). In 18 of the 26 entries, the number of cases was in the triple digits (Azimi and Esmaeilzadeh, 2017; Baiden et al., 2011; Freeman and Manturuk, 2019; Galster, 1987; Huang and Du, 2015a; Ibem et al., 2019; Lee et al., 2021; Li et al., 2019; Nguyen et al., 2017; Pongpraesert and Chatrkaw, 2023; Tao et al., 2014) ranging from 105 (Azimi and Esmaeilzadeh, 2017) to 642 individuals (Li et al., 2019).

3.3. Research questions and objectives

Four of the included studies (22.2%) (Ahn and Lee, 2016; Foye, 2017; Huang and Du, 2015a; Li et al., 2019) explicitly formulated research questions in the text. One of these studies (Ahn and Lee, 2016) and two others (n = 3; 16.7%) (Freeman and Manturuk, 2019; Tao et al., 2014) also stated clear hypotheses (in the form of H1, H2, etc.). The research objectives of the 18 included studies could be assigned to five overarching thematic categories addressing different content areas. For a better overview and to illustrate frequencies, these are presented in Table 4. Three studies (16.7%) analyzed the relationship between housing satisfaction and specific housing types or different housing typologies, such as single-family homes, multi-family homes, residential complexes, or publicly subsidized rental apartments (Azimi and Esmaeilzadeh, 2017; Huang and Du, 2015a; Li et al., 2019). Five studies (27.8%) focused on specific population groups such as older people, low-income households, or migrants and examined their housing satisfaction in their respective living environments (Ahn and Lee, 2016; Ibem et al., 2019; Lee et al., 2021; Tao et al., 2014; Zeng et al., 2020). Four studies (22.2%) examined different aspects of ownership and access to home ownership. The focus was on comparing the residential satisfaction of tenants and owners, the influence of housing loans on satisfaction, and the relationship between affordable home ownership and residential satisfaction (Freeman and Manturuk, 2019; Huang et al., 2015b; Nguyen et al., 2017, 2019). According to Nguyen et al. (2017), affordable property was defined as housing that was financially accessible to low- and middle-income households. Five studies (27.8%) examined housing/residential satisfaction in the context of other factors influencing subjective well-being (Baiden et al., 2011; Foye, 2017; Noor et al., 2014; Pongpraesert and Chatrkaw, 2023; Salas and Vigorito, 2019). These studies considered the ability to cope with day-to-day demands (Baiden et al., 2011), life satisfaction (Foye, 2017; Salas and Vigorito, 2019), mental health (GHQ caseness) (Foye, 2017), satisfaction with the urban environment (town satisfaction) (Zeng et al., 2020), and various dimensions of family and social well-being (Noor et al., 2014). One study (5.6%) focused on theoretical and methodological approaches to explaining housing satisfaction. The focus was on the further development of empirical models, particularly by taking into account non-linear relationships and differentiating between household types (Galster, 1987).

3.4. Regression methods for examining housing satisfaction and residential satisfaction

All included studies used multiple regression analyses in which spatial indicators such as living space, living space per capita, number of [bed]rooms, or the persons-per-room ratio were modeled as predictors

Table 4
Thematic categories of research questions and objectives in included studies.

Category / Study (1st author)	Housing typologies/ types and their relationship to housing/residential satisfaction	Population-specific perspectives on housing/ residential satisfaction	Ownership and access to housing in relation to housing/ residential satisfaction	Housing/ residential satisfaction in broader life contexts	Theoretical and methodological approaches to housing satisfaction
Ahn (2016)		x			
Azimi (2017)	x				
Baiden (2011)				x	
Foye (2017)				x	
Freeman (2018)			x		
Galster (1987)					x
Huang (2015a)	x				
Huang (2015b)			x		
Ibem (2019)		x			
Lee (2021)		x			
Li (2019).	x				
Nguyen (2017)			x		
Nguyen (2019)			x		
Noor (2014)				x	
Pongpraesert (2023)				x	
Salas (2019)				x	
Tao (2014)		x			
Zeng (2020)		x			

of housing satisfaction. Other regression analyses that were included in some of the studies but did not consider relevant indicators or had a different thematic focus were not included in this analysis. Of the 18 studies included, nine studies (50%) used ordinary least squares (OLS) regression (Ahn and Lee, 2016; Foye, 2017; Freeman and Manturuk, 2019; Galster, 1987; Lee et al., 2021; Nguyen et al., 2017; Noor et al., 2014; Pongpraesert and Chatrkaw, 2023; Salas and Vigorito, 2019). Among these, three studies used stepwise regression approaches with three models (Freeman and Manturuk, 2019; Salas and Vigorito, 2019) and four models (Nguyen et al., 2017). Four studies (22.2%) used multiple ordinal logistic regressions with a stepwise approach, including three models (Tao et al., 2014; Zeng et al., 2020), four models (Huang et al., 2015b) and seven models (Huang and Du, 2015a). Two studies (11.1%) used categorical regression (CATREG) (Azimi and Esmaeilzadeh, 2017; Ibem et al., 2019). One study (5.6%) used binary logistic regression with a stepwise approach across seven models (Baiden et al., 2011), another (5.6%) used a generalized ordered logistic model (GOLM) for four binary comparisons (Li et al., 2019), and a further study (5.6%) used a two-stage least squares regression method (2SLS) (Nguyen et al., 2019).

3.5. Conceptual dimensions and determinants of housing satisfaction and residential satisfaction

In the studies analyzed, housing/residential satisfaction was modeled using a variety of explanatory variables. The selection, number, and categorization of these factors varied considerably between studies. The categorization shown in Tables 5–6 was developed as part of this review in order to classify the explanatory variables systematically and comparably. The tables show the number of factors analyzed in each study, sorted by assigned category. A complete descriptive list of the variables and their assignment to the category scheme is presented in Appendix D and Appendix E.

Different category systems were used in the studies to classify the determinants of housing/residential satisfaction. Ahn and Lee (2016), for example, divided their parameters into personal factors, physical factors, financial factors, and environmental factors, while Azimi and Esmaeilzadeh (2017) divided them into demographic characteristics, building characteristics, and neighborhood characteristics. Baiden et al. (2011) distinguished between sociodemographic factors, housing characteristics, housing condition, demand/control, and the meaning one attaches to where he or she lives, among other things, and Ibem et al. (2019) created a differentiated system with categories such as socioeconomic and demographic characteristics of residents, components of the residential environment (housing units attributes, housing unit support services, neighborhood environment, and management of features), objective and subjective characteristics of residential environment, and satisfaction with the neighborhood and the housing unit.

Table 5
Number of variables analyzed in each study, grouped according to categories developed for this review (housing satisfaction).

Studies (1st author) with housing satisfaction:	Individual and household-related characteristics	Dwelling and housing-related characteristics	Neighborhood and environmental characteristics	Number of all variables
Ahn (2016)	7	8	0	15
Baiden (2011)	4	5	2	11
Foye (2017)	11	13	14	38
Freeman (2019)	1	8	10	19
Galster (1987)	0	8	0	8
Lee (2021)	8	4	0	12
Nguyen (2017)	8	8	3	19
Nguyen (2019)	8	7	7	22
Noor (2014)	1	1	0	2
Salas (2019)	1	1	0	2
Range	0–11	1–13	0–14	

Table 6
Number of variables analyzed in each study, grouped according to categories developed for this review (residential satisfaction).

Studies (1st author) with residential satisfaction:	Individual and household-related characteristics	Dwelling and housing-related characteristics	Neighborhood and environmental characteristics	Number of all variables
Azimi (2017)	7	10	8	25
Huang (2015a)	7	6	11	24
Huang (2015b)	5	7	3	15
Ibem (2019)	6	3	5	14
Li (2019)	7	7	4	18
Pongpraesert (2023)	0	5	3	8
Tao (2014)	13	6	4	23
Zeng (2020)	8	6	6	20
Range	0–13	3–10	3–11	

Tables 5–6 only consider variables that were included in the regression models to explain housing/residential satisfaction.

Some studies discussed more potential factors influencing housing/residential satisfaction, but only included a selection of these variables in their regression analyses. For example, Galster (1987) presented sociodemographic characteristics such as education, income, marital status, or race, as well as housing-related characteristics such as rooms per person (ROOM/OCC), bathrooms per person (BATH/OCC), or the year of construction of the building (e.g., BUILT40–59) and assigned them expected effect directions. However, he only elaborated on or analyzed some of them. Another example was provided by Pongpraesert and Chatrkaw (2023), who tested a total of 31 variables but only considered the eight variables that proved to be significant in a stepwise regression in their final analysis of housing satisfaction. These examples show that the modeled variables often represent a selection from a broader spectrum.

3.6. Methods for operationalizing housing satisfaction and residential satisfaction

In line with the objective of this scoping review, the included studies either focused on the dependent variable of housing satisfaction (n = 10; 55.6%) (Ahn and Lee, 2016; Baiden et al., 2011; Foye, 2017; Freeman and Manturuk, 2019; Galster, 1987; Lee et al., 2021; Nguyen et al., 2017, 2019; Noor et al., 2014; Salas and Vigorito, 2019) or residential satisfaction (n = 8; 44.4%) (Azimi and Esmaeilzadeh, 2017; Huang and Du, 2015a; Huang et al., 2015b; Ibem et al., 2019; Li et al., 2019; Pongpraesert and Chatrkaw, 2023; Tao et al., 2014; Zeng et al., 2020). Both variables differ in terms of their frame of reference: While housing satisfaction primarily focuses on characteristics of the home itself (Lu, 1999; Maggino, 2024; Saleem and Alchalabi 2025; Weidemann and Anderson, 1985) – such as living size, amenities, or comfort – residential satisfaction also encompasses aspects of the immediate living environment, in particular the neighborhood, and in some cases the wider urban environment (Abidin et al., 2019; Maggino, 2024; Mridha, 2023; Balestra and Sultan, 2013). For both variables, terms that were sometimes different but related in content were used. For example, Galster (1987) referred to satisfaction with the home as dwelling satisfaction, while Noor et al. (2014) used the term overall satisfaction with housing, noting: “This refers to the family having adequate housing/shelter and basic amenities.” In five studies (27.8%), the term residential satisfaction was supplemented by the prefix “overall” and referred to as overall

residential satisfaction (Azimi and Esmaeilzadeh, 2017; Li et al., 2019; Pongpraesert and Chatrkaw, 2023; Tao et al., 2014; Zeng et al., 2020).

In 12 of the 18 studies (66.7%), the wording of the survey question for the dependent variable was explicitly stated (Ahn and Lee, 2016; Baiden et al., 2011; Foye, 2017; Freeman and Manturuk, 2019; Galster, 1987; Lee et al., 2021; Nguyen et al., 2017, 2019; Noor et al., 2014; Salas and Vigorito, 2019). The complete question was available for all ten studies on housing satisfaction. For residential satisfaction, on the other hand, the specific questions were only available in two of the eight studies (11.1%).

Regardless of whether the focus was on housing satisfaction or residential satisfaction, satisfaction was measured in all studies using Likert scales, although there were differences in scale level and range. In most cases, the scale ranged from 1 to 5 (n = 13, 72.2%) (Azimi and Esmaeilzadeh, 2017; Baiden et al., 2011; Huang and Du, 2015a; Huang et al., 2015b; Ibem et al., 2019; Lee et al., 2021; Li et al., 2019; Nguyen et al., 2017, 2019; Pongpraesert and Chatrkaw, 2023; Salas and Vigorito, 2019; Tao et al., 2014; Zeng et al., 2020). In the study by Baiden et al. (2011) the results were subsequently converted into a dichotomous variable (1–3 vs. 4–5). Noor et al. (2014) used the most extensive scale, ranging from 0 to 10, followed by Ahn and Lee (2016) and Freeman and Manturuk (2019) with a scale from 1 to 10 and Foye (2017) with a scale from 1 to 7. Galster (1987), on the other hand, surveyed each of the sub-dimensions of housing satisfaction he defined on a three-point scale (0–2); summing these individual values resulted in a maximum total value of 20.

Tables 7–8 show the included studies with the terminology used for the dependent variable, the underlying question, and the rating scale used.

Table 7
Terminology, question wording, and measurement scales used for housing satisfaction.

Study (1st author)	Dependent variable as specified in study	Question	Scale
Ahn (2016)	Housing satisfaction	How would you rate your unit as a place to live?	1–10
Baiden (2011)	Housing satisfaction	How satisfied are you with your present house as a living place?	1–5 (dichotomized in 1–3 vs. 4–5)
Foye (2017)	Housing satisfaction	How dissatisfied or satisfied are you with your house/flat?	1–7
Freeman (2019)	Housing satisfaction	How would you rate your dwelling as a place to live?	1–10
Galster (1987)	Dwelling satisfaction	Could you indicate if you are currently satisfied, dissatisfied, or neither satisfied nor dissatisfied about this feature X of your home?" X = plumbing, kitchen, heating equipment, interior condition, exterior condition, modernity, floor space, yard space, bathrooms, and privacy.	0–2 for each X
Lee (2021)	Residential satisfaction	Overall, how satisfied are you with your housing?	1–5
Nguyen (2017)	Housing satisfaction	Taken altogether, how satisfied are you with your apartment at present?	1–5
Nguyen (2019)	Housing satisfaction	Taken altogether, how satisfied are you with your apartment at present?	1–5
Noor (2014)	Overall satisfaction with housing	Overall, how satisfied are you with the basic amenities in your housing area?*Note: This refers to the family having adequate housing/ shelter and basic amenities.*	0–10
Salas (2019)	Satisfaction with housing	How satisfied are you with your house?	1–5

Table 8
Terminology, question wording, and measurement scales used for residential satisfaction.

Study (1st author)	Dependent variable as specified in study	Question	Scale
Azimi (2017)	Overall residential satisfaction	–	1–5
Huang (2015a)	Residential satisfaction	–	1–5
Huang (2015b)	Residential satisfaction	–	1–5
Ibem (2019)	Residential satisfaction	How satisfied are you with your housing situation in general?	1–5
Li (2019)	Overall residential satisfaction	How satisfied are you with the current PRH (public rental housing) neighborhood?	1–5 (dichotomized in 1 vs. 2–5; 1–2 vs. 3–5; 1–3 vs. 4–5; 1–4 vs. 5)
Pongpraesert (2023)	Overall residential satisfaction	–	1–5
Tao (2014)	Overall residential Satisfaction	–	1–5
Zeng (2020)	Overall residential satisfaction	–	1–5

4. Data and activities of interest

4.1. Measures of living space [per capita], number of [bed]rooms, and density

The independent variables examined showed conceptual heterogeneity. Although the measures always referred to living space, they were named in a variety of ways: size (Nguyen et al., 2017; Zeng et al., 2020), house size (Nguyen et al., 2019; Pongpraesert and Chatrkaw, 2023), size of residence (Ibem et al., 2019), structure size (Ahn and Lee, 2016), area (Huang et al., 2015b), number of bedrooms (Azimi and Esmaeilzadeh, 2017; Huang and Du, 2015a; Ibem et al., 2019; Noor et al., 2014), number of rooms (Nguyen et al., 2017), people per bedroom (Freeman and Manturuk, 2019), crowding index (Baiden et al., 2011), crowding (Salas and Vigorito, 2019), rooms per person (Foye, 2017), rooms per occupant (Galster, 1987), per capita living space (Li et al., 2019), and housing adequacy: usage area per person (Tao et al., 2014). These terms were standardized for better comparability.

Direct metric data were available in six studies (33.3%) for the number of bedrooms (Ahn and Lee, 2016; Azimi and Esmaeilzadeh, 2017; Huang and Du, 2015a; Lee et al., 2021; Noor et al., 2014; Tao et al., 2014), in five studies for living space (27.8%) (Azimi and Esmaeilzadeh, 2017; Huang and Du, 2015a; Nguyen et al., 2017, 2019; Tao et al., 2014), in two studies for square meters per person (11.1%) (Tao et al., 2014; Zeng et al., 2020), for the number of rooms (11.1%) (Nguyen et al., 2017, 2019), persons per room (11.1%) (Baiden et al., 2011; Salas and Vigorito, 2019), and rooms per person (11.1%) (Foye, 2017; Galster, 1987). A direct value was reported for the indicator of persons per bedroom (5.6%) (Freeman and Manturuk, 2019); no direct data were available for bedrooms per person. Values that were not

Table 9
Reported variables and calculated indicators related to dwelling size and occupancy density.

Measures / Study (1st author)	Household size	Square meters	Number of rooms	Number of bedrooms	Sqm per person	Persons per room	Persons per bedroom	Rooms per person	Bedrooms per person
Ahn (2016)	1.0			2.53			**0.40**		**2.53**
Azimi (2017)	*3.50*	129.55		2.23	**37.01**		**1.57**		**0.64**
“	*3.53*	93.56		1.85	**26.50**		**1.91**		**0.52**
“	*3.56*	91.62		1.97	**25.74**		**1.81**		**0.55**
Baiden (2011)						4.82		**0.21**	
Foye (2017)								1.66[1]	
Freeman (2019)							1.06		**0.93**
“							1.12		**0.89**
Galster (1987)						**0.41**		2.43	
Huang (2015a)	*2.51*	58.78		1.64	**23.42**		**1.53**		**0.65**
“	*1.83*	48.93		1.26	**26.79**		**1.45**		**0.69**
“	*2.04*	53.64		1.37	**26.33**		**1.49**		**0.67**
“	*3.38*	79.01		2.18	**23.35**		**1.55**		**0.64**
“	*2.40*	42.10		1.52	**17.56**		**1.58**		**0.63**
Huang (2015b)	*2.92*	*59.0*			**20.21**				
Ibem (2019)	*3.86*			*2.08*			**1.86**		**0.54**
Lee (2021)	1.70			2.60			**0.65**		**1.54**
Li (2019)	*2.07*	*45.87*			**22.16**				
Nguyen (2017)	3.70	77.20	2.25		**20.86**	**1.64**		**0.61**	
Nguyen (2019)	3.55	71.69	2.10		**20.19**	**1.69**		**0.59**	
Noor (2014)	5.48			3.29			**1.67**		**0.60**
Pongpraesert (2023)	*3.95*	*168.43*		*3.13*	**42.67**		**1.26**		**0.79**
Salas (2019)						1.89		**0.53**	
Tao (2014)	4.0	48.50	**3.0**	2.0	15.40[2]	**1.33**	**2.0**	**0.75**	**0.5**
Zeng (2020)	2.63	**58.91**			22.4				
Sum[3]	I = 7 *II = 6* **III = 0**	I = 5 *II = 3* **III = 1**	I = 2 *II = 0* **III = 1**	I = 6 *II = 2* **III = 0**	I = 2 *II = 0* **III = 7**	I = 2 *II = 0* **III = 4**	I = 1 *II = 0* **III = 8**	I = 2 *II = 0* **III = 5**	I = 0 *II = 0* **III = 9**

Note.
Regular font indicates category I, italics indicate category *II*, and bold indicates category **III**.
I = Metric data taken directly from the original study (e.g., m^2 per person, household size, number of people per room).
II = Approximate values based on interval or range data reported in the paper (e.g., 61–80 m^2; > …; more than …; … or above).
III = Derived values based on the mathematical combination of data from I and/or II.
[1]Median and not arithmetic mean.
[2]The value for living space per person was taken from the study. However, when the living space is divided by the household size, the result is 12.13 m^2.
[3]In the summary row, each source (study) was counted only once per variable, even if multiple values were reported. The goal was to determine how many distinct studies provided data for each variable.

directly available in metric form were estimated or derived based on reported categories, interval classes, or other quantitative data. In the summary row of Table 9, each study was counted only once per variable, regardless of whether multiple values were reported. Across all variables, 27 counts were based on directly reported metric data, 11 on approximations, and 35 on mathematically derived values. This distribution indicates that harmonization was frequently required, particularly for several per-person and density indicators. No formal validation of these derived indicators against the original study results was undertaken, and no formal sensitivity checks were conducted. Table 9 therefore shows not only the basis for data collection for all values used, but also the varying degree of harmonization across indicators. The specific numerical values to which this information refers, including the basis for calculation, are shown in the data charting (Nebel et al., 2025).

4.2. Satisfaction scores

In a total of 26 entries analyzed, derived from 18 included studies, numerical values for satisfaction scores were available in 16 cases (61.5%) (Ahn and Lee, 2016; Azimi and Esmaeilzadeh, 2017; Freeman and Manturuk, 2019; Galster, 1987; Huang and Du, 2015a; Huang et al., 2015b; Ibem et al., 2019; Lee et al., 2021; Nguyen et al., 2019; Noor et al., 2014). Three entries (11.5%) did not provide any indication of a score (Baiden et al., 2011; Foye, 2017), and in seven cases (26.9%), there were indications that satisfaction had been surveyed, but without specific numerical data. First, there were four cases (15.4%) in which no mean values were reported, but the distribution of responses to ordinally scaled satisfaction categories (e.g., very dissatisfied to very satisfied) was available – either as percentages and/or as absolute case numbers. In these cases, the mean value was determined by calculating a weighted average based on assigned point values (e.g., 1 to 5) (Li et al., 2019; Nguyen et al., 2017; Tao et al., 2014; Zeng et al., 2020). In another case (3.8%), no overall value for residential satisfaction was reported, but satisfaction values for several related sub-areas (overall satisfaction with housing characteristics, overall satisfaction with neighborhood characteristics, overall satisfaction with working from home characteristics) were available on a common scale and within the same sample. Here, the overall residential satisfaction value was determined as the arithmetic

Table 10
Reported satisfaction scores in studies investigating housing satisfaction, including original scale values and standardized scores (0–1).

Study (1st author)	Scale	Score	Standardized score (0–1)
Ahn (2016)	1–10	8.64	0.85
Freeman (2019)	1–10	8.2	0.80
“	1–10	7.6	0.73
Galster (1987)	0–20	17.4	0.87
Lee (2021)	1–5	3.64	0.66
Nguyen (2017)	1–5	3.36[1]	0.59
Nguyen (2019)	1–5	3.46	0.61
Noor (2014)	0–10	7.55	0.76
Salas (2019)	1–5	3.64[1]	0.66

Note. [1]self-calculated.

Table 11
Reported satisfaction scores in studies investigating residential satisfaction, including original scale values and standardized scores (0–1).

Study (1st author)	Scale	Score	Standardized score (0–1)
Azimi (2017)	1–5	3.85	0.71
“	1–5	3.73	0.68
“	1–5	3.82	0.70
Huang (2015a)	1–5	3.59[1]	0.65
“	1–5	4.02	0.75
“	1–5	3.59	0.65
“	1–5	3.36	0.59
“	1–5	3.44	0.61
Huang (2015b)	1–5	2.89	0.47
Ibem (2019)	1–5	2.86	0.46
Li (2019)	1–5	3.52[1]	0.63
Pongpraesert (2023)	1–5	3.58[1]	0.65
Tao (2014)	1–5	2.77[1]	0.44
Zeng (2020)	1–5	3.39[1]	0.60

Note. [1]self-calculated.

mean of these sub-areas (Pongpraesert and Chatrkaw, 2023). In two cases (7.7%), values for housing satisfaction or residential satisfaction were available, but only for separate subgroups – for example, according to forms of housing allocation and financing (cheap rental, public rental, economically comfortable, monetarily subsidized) (Huang and Du, 2015a) or according to survey years (2004 and 2011/12) (Salas and Vigorito, 2019). Since the group sizes were known in both cases, an overall value was calculated using weighted averages.

To ensure comparability of the scores, all satisfaction values were standardized to a uniform scale from 0 to 1, regardless of the original scale format. Tables 10–11 provide an overview of the scale formats used in the individual studies, the original satisfaction values, and the standardized scores calculated from them.

5. Key findings

5.1. Findings on living space/occupancy density and satisfaction (research question 1)

The following results address the first research question of this review by examining how primary studies describe the relationship between per-person living space and/or occupancy density and subjective housing/residential satisfaction. The following subsections provide (1) an overview of significant regression findings, (2) an evaluation of the reported significance levels for various space indicators, and (3) a visualization of key correlations based on standardized satisfaction values. The aim is to present the empirical evidence on the direction and strength of the association in a consistent and comparable manner.

5.1.1. Regression analyses

The primary studies reported both significant and non-significant correlations between various indicators of living space and occupancy density and housing/residential satisfaction (Appendix F). Table 12 summarizes only the statistically significant regression findings and contains – where reported – the non-standardized coefficient (B), the standardized coefficient (β), and the odds ratio (OR) for each study, supplemented by a brief interpretation of the values (see footnote for an explanation of the coefficients). In seven cases, the ORs were not reported directly but were calculated from the respective B values ($OR = e^B$). Overall, the reported findings show predominantly positive effects

Table 12
Significant associations between indicators of living space/occupancy density and housing/residential satisfaction.

Indicator	Study (1st author)	reported B	reported ß	OR	p	Regression	Interpretation
sqm	Huang (2015a)	0.026		1.026[1]	< 0.001	ordinal logistic	Each additional sqm increases odds of satisfaction by ~2.6%.
sqm	Huang (2015a)	0.031		1.031[1]	< 0.1	ordinal logistic	Each additional sqm increases odds of satisfaction by ~3.1%.
sqm	Huang (2015a)	0.077		1.08[1]	< 0.001	ordinal logistic	Each additional sqm increases odds of being more satisfied by ~8%.
sqm	Huang (2015b)	0.13		1.139[1]	< 0.001	ordinal logistic	Each additional sqm increases odds of satisfaction by ~13.9%.
sqm	Pongprasert (2023)	0.123	0.145		< 0.001	OLS	Each additional sqm increases satisfaction by ~0.123 (on a scale of 1–5).
sqm/person	Li (2019) col3	0.325		1.384[1]	< 0.01	GOLM (for four binary logistic comparisons)	Each additional sqm/per person increases the odds of being satisfied or very satisfied (versus being neutral, dissatisfied, or very dissatisfied) by approximately 38.4%.
sqm/person	Li (2019) col4	0.535		1.707[1]	< 0.01	GOLM (for four binary logistic comparisons)	Each additional sqm/person increases the odds of being very satisfied (versus satisfied, neutral, dissatisfied, or very dissatisfied) by approximately 70.7%
sqm/person (log)	Zeng (2020)	1.812		6.31[1]	< 0.01	ordinal logistic	2.7-fold increase in sqm/person increases satisfaction odds by ~513%.
rooms/person	Galster (1987)		0.28		< 0.1	OLS	Positive effect up to ~3.5–4.6 rooms/person, then diminishing.
rooms/person	Foye (2017)	0.544			< 0.01	OLS	Each additional room per person increases satisfaction by 0.544 points (on a scale of 1–7). Positive effect up to ~3.6 rooms/person, then diminishing.
rooms/person	Foye (2017)	0.464			< 0.01	OLS	Each additional room per person increases satisfaction by 0.464 points (on a scale of 1–7). Positive effect up to ~3.9 rooms/person, then diminishing.
bedrooms	Lee (2021)	0.267	0.267		< 0.05	OLS	Each additional bedroom increases satisfaction by ~0.267 points (on a scale of 1–5).
bedrooms	Noor (2014)	0.208	0.117		0.0001	OLS	Each additional bedroom increases satisfaction by ~0.208 points (on a scale of 0–10).
persons/room	Baiden (2011)			1.151	< 0.05	binary logistic	Each additional person per room increases the odds of being dissatisfied by ~15%.
persons/room	Salas (2019)	–0.104			< 0.05	OLS	Each additional person per room decreases satisfaction by 0.104 points (on a scale of 1–5).

Note. [1]self-calculated.

Table 13
Relationship between living space availability, occupancy density and housing/residential satisfaction.

Indicator	Significant positive	Significant negative	Non-significant positive	Non-significant negative	Non-significant, no direction
square meters	5	0	4	1	2
number of rooms	0	0	2	0	0
number of bedrooms	2	0	4	6	0
square meters per person	2	0	1[2]	0	1
persons per room	2[1]	0	0	0	0
rooms per person	3	0	0	0	0
persons per bedroom	0	0	2[1]	0	0
Sum	14	0	13	7	3

Note.
[1]For better comparability, the direction of the effects was standardized: a negative correlation between "persons per [bed]room" and housing/residential satisfaction (Freeman and Manturuk, 2019; Salas and Vigorito., 2019) was evaluated as a positive effect of housing availability. Baiden et al. (2011) also took into account that the scale was reverse coded (1–3 = satisfied, 4–5 = dissatisfied), so that the positive effect on dissatisfaction was also interpreted as a negative effect on satisfaction and thus as a positive effect of housing availability.
[2]In study by Li et al. (2019), the negative effect in model 1 vs. 2–5 (B = –0.263) was interpreted as a positive influence of housing availability, as the lowest satisfaction level (1 = very dissatisfied) was defined as the target category. Accordingly, this effect was assigned to the category non-significant positive.

of living space availability (living space [per capita]) on housing/residential satisfaction, while higher occupancy densities (persons per [bed] room) tend to be associated with lower satisfaction scores.

Values in the "B" column were interpreted in part as non-standardized regression coefficients unless the original source explicitly reported them as standardized beta coefficients; classification was made to the best of our knowledge based on the statistical method and the magnitude of the reported values.

5.1.2. *Summary of effect directions and significance levels*

Given the substantial heterogeneity of the included studies with regard to model specification, covariates, measurement scales, and regression approaches, the reported coefficients do not represent directly comparable quantitative estimates. Rather, the following results provide a qualitative synthesis of evidence focusing on effect directions, significance levels, and broader patterns across studies. The evaluation of the effect directions and significance levels of all regression models included in the analysis (Table 12 and Appendix F) shows that a large proportion of the indicators examined for living space were significantly positively associated (after standardization of the effect direction) with housing satisfaction or residential satisfaction. Table 13 illustrates that 14 significantly positive effects were identified (Baiden et al., 2011; Foye, 2017; Galster, 1987; Huang and Du, 2015a; Huang et al., 2015b; Lee et al., 2021; Li et al., 2019; Noor et al., 2014; Pongpraesert and Chatrkaw, 2023; Salas and Vigorito, 2019; Zeng et al., 2020). The most common significantly positive correlations with satisfaction were found for total floor area (n = 5) (Huang and Du, 2015a; Huang et al., 2015b; Pongpraesert and Chatrkaw, 2023), which was also the most frequently surveyed indicator, and for the ratio of rooms per person (n = 3) (Foye, 2017; Galster, 1987). It is noteworthy that no significant negative effects were found – an indication of the uniform direction of the association. A total of 24 non-significant results were identified. These included non-significant positive effects (n = 13) (Ahn and Lee, 2016; Azimi and Esmaeilzadeh, 2017; Freeman and Manturuk, 2019; Huang and Du, 2015a; Li et al., 2019), non-significant negative effects (n = 7) (Azimi and Esmaeilzadeh, 2017; Huang and Du, 2015a; Ibem et al., 2019), and effects without a clearly interpretable direction (n = 3) (Nguyen et al., 2017, 2019; Tao et al., 2014). This illustrates that, despite generally positive correlations, the evidence for individual indicators remains inconsistent and must be interpreted in a context- and model-dependent manner.

A noticeable share of the non-significant results concerned the indicator number of bedrooms. Although this indicator was examined in a total of ten regression models, these were derived from only four studies (Ahn and Lee, 2016; Azimi and Esmaeilzadeh, 2017; Huang and Du, 2015a; Ibem et al., 2019). The accumulation of non-significant findings cannot therefore necessarily be interpreted as an indication of a weakness in content. Rather, it is likely to be due to methodological factors – such as multiple models within the same study or distinctions between housing types or allocation schemes (i.e., systems regulating how housing units are assigned), as seen in Azimi and Esmaeilzadeh (2017) and Huang and Du (2015a). Such differentiations reduce the number of cases per subgroup and make it more difficult to identify statistically significant correlations, especially in more complex models with many predictors. In addition, the direction of the effects was inconsistent: both positive and negative (non-significant) estimates were reported in the studies mentioned. This points to possible context-specific influencing conditions. Beyond this pattern, no sufficiently consistent trend could be identified with regard to average dwelling size, geographical distribution, or demographic characteristics. The non-significant findings therefore appear to be shaped less by one uniform contextual factor than by differences in indicator operationalization, model specification, and sample composition. Given the small and heterogeneous evidence base, these observations should be interpreted with caution.

5.1.3. *Visualization of key associations*

The graphical representation of the relationship between standardized satisfaction scores (0–1) and living space per person (Fig. 2) shows an overall positive trend, with satisfaction tending to increase as floor area increases. The regression line plotted underscores this trend, even

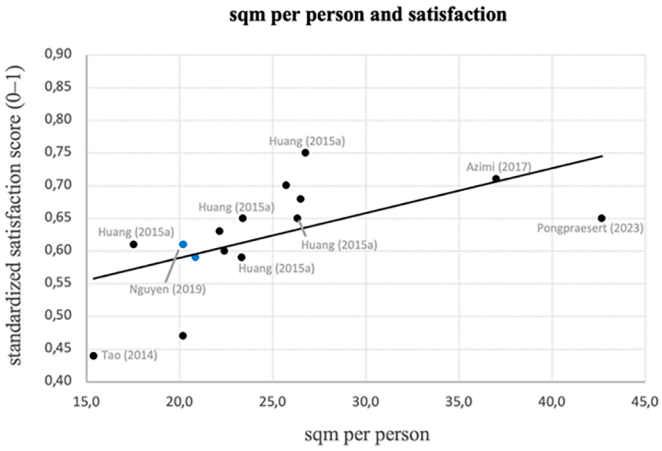


Fig. 2. Relationship between available living space per person and standardized satisfaction score. (linear regression line: $y = 0.0069x + 0.453$, $R^2 = 0.34$).

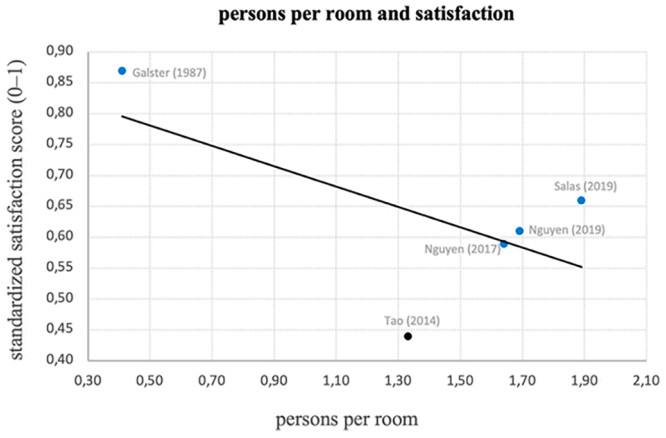


Fig. 3. Relationship between persons per room and standardized satisfaction score. (linear regression line: $y = -0.1645x + 0.863$, $R^2 = 0.38$).

though the distribution of points indicates a certain degree of dispersion. This is particularly evident at the upper end of the scale, for example in Azimi and Esmaeilzadeh (2017) and Pongpraesert and Chatrkaw (2023), whose samples showed satisfaction scores of 0.70 to 0.75 at around 37 and 43 m^2 per person, respectively. In contrast, lower area values, such as those reported by Tao et al. (2014) at 15.4 m^2 per person, were associated with lower satisfaction scores (0.44). However, this correlation is not strictly linear: even average areas in the range of approximately 20–26 m^2 per person showed comparatively stable satisfaction values (e.g., Huang and Du, 2015a, or Nguyen et al., 2019). In terms of content, the indicator "persons per room" – as an inverse measure of living space per person – also showed a correlation with housing satisfaction. Fig. 3 clearly shows that higher density values are more often associated with lower satisfaction scores. Satisfaction at occupancy densities above 1.6 persons per room – for example, as reported by Nguyen et al. (2017) (1.64 persons; satisfaction 0.59), Nguyen et al. (2019) (1.69; 0.61) and Salas and Vigorito (2019) (1.89; 0.66) reported – was in the lower to middle range. Based on data from Tao et al. (2014), a particularly low value of 0.44 was found for 1.33 people per room. For the data from Galster (1987), a significantly lower occupancy density of only 0.41 persons per room resulted in a comparatively high satisfaction rating of 0.87. A similar pattern can be seen in the ratio of persons per bedroom (Fig. 4). As the number of persons per bedroom increased, satisfaction ratings tended to decline. High occupancy rates, such as those reported by Tao et al. (2014) (2.0; 0.44) or Ibem et al.

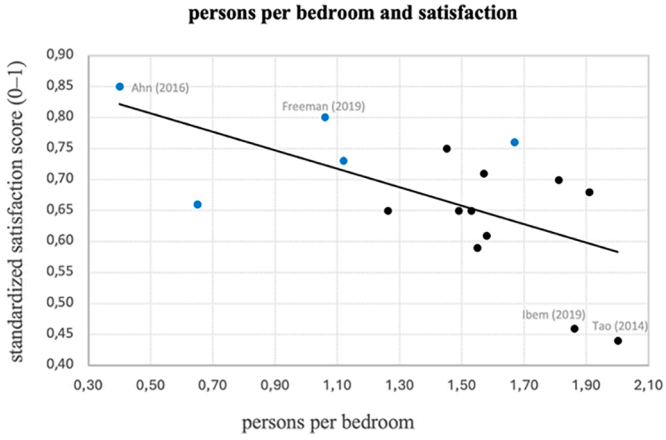


Fig. 4. Relationship between persons per bedroom and standardized satisfaction score. (linear regression line: $y = -0.1491x + 0.882$, $R^2 = 0.37$).

(2019) (1.86; 0.46), were found at the lower end of the scale. Conversely, lower occupancy rates (≤ 1.2 persons per bedroom) showed comparatively high satisfaction scores (> 0.70), for example in Freeman and Manturuk (2019) or Ahn and Lee (2016). Here, too, the trend line indicated an overall negative correlation between occupancy density and satisfaction.

The underlying point values for Figs. 2–4 can be found in Appendix H. The blue dots mark the dependent variable housing satisfaction, while the black dots show residential satisfaction. The regression lines shown in Figs. 2–4 are based on aggregated study-level values and are intended as exploratory visualizations of broad patterns across studies. As they do not rely on individual-level data and do not incorporate study sample sizes or weights, they should not be interpreted as analytical evidence of causal relationships.

5.2. *Influencing factors (research question 2)*

Since no direct interaction tests between living space indicators and potential influencing factors were carried out in the primary studies, the second research question – namely, which factors moderate (or influence) the relationship between housing/residential satisfaction and living space or occupancy density – could not be answered directly. Instead, the approach was taken in two steps: (1) by analyzing multiple regression models with stepwise covariates and (2) by comparing subgroup analyses conducted in the primary studies.

5.2.1. *Effects of additional covariates in stepwise multivariable models*

The analyses of the stepwise models (Table 14) showed that the explained variance ([pseudo]R^2) tended to increase across the model stages. This indicates the additional explanatory power of the supplemented variables, regardless of whether the effect of the space indicator changed (Baiden et al., 2011; Freeman and Manturuk, 2019; Huang and Du, 2015a; Huang et al., 2015b; Nguyen et al., 2017; Salas and Vigorito, 2019; Tao et al., 2014; Zeng et al., 2020). However, in five cases with significant effects of living space indicators, the relationship remained largely stable across model stages (Baiden et al., 2011; Huang and Du, 2015a; Huang et al., 2015b; Salas and Vigorito, 2019; Zeng et al., 2020). This suggests that the added variables did not significantly alter the relationship between housing/residential satisfaction and living space, but rather captured additional, independent aspects of housing/residential satisfaction.

5.2.2. *Additional predictors of housing/residential satisfaction in multiple models*

Fig. 5 shows significant covariates identified in regression models in which living space was also significantly associated with housing/residential satisfaction. The factors shown were assigned to the three analytical categories based on their similarity in content: (1) individual and household-related characteristics, (2) dwelling and housing-related characteristics, and (3) neighborhood and environmental characteristics. A list of the respective sources and effect directions is documented in Appendix I. The studies analyzed show that, in addition to living space, individual, housing-related, and contextual characteristics also play a role and that housing/residential satisfaction should be understood as a multidimensional concept that cannot be explained solely by quantitative spatial dimensions.

5.2.3. *Moderating effects: evidence from subgroup analyses*

As no significant interaction effects were found in the stepwise regression models, the analysis focused on subgroup comparisons reported in six (33.3%) of the included studies (Foye, 2017; Galster, 1987; Huang and Du, 2015a; Huang et al., 2015b; Li et al., 2019; Salas and Vigorito, 2019) (Table 15). The results varied. Huang and Du (2015a) showed that the housing segment (housing allocation scheme/types of housing) primarily influenced the level of satisfaction, while the positive living space effect remained robust. Li et al. (2019) pointed to

Table 14
Stepwise regression results – effects of space indicators on housing satisfaction.

Study (1st author)	Indicator	Model steps	Effect (OR/B/ß)	Significance	[Pseudo-]R^2	Change in effect (Interpretation)
Baiden (2011)	Crowding index	3: Housing characteristics 4: Housing conditions 5: Demand/control 6: Meaning 7: Model with interactions	1.158 1.161 1.150 1.136 1.151	$p < 0.5$ $p < 0.5$ $p < 0.5$ $p < 0.1$ $p < 0.5$	0.204 0.229 0.282 0.288 0.299	Effect remained largely stable across model steps; one minor fluctuation and a single borderline non-significant stage.
Freeman (2019)	People per bedroom	2: Housing physical characteristics 3: Neighborhood characteristics	–0.071 –0.107	$p > 0.05$ $p > 0.05$	0.10 0.49	No statistically significant effect across model steps; increases in R^2 likely due to other variables.
Freeman (2019)	People per bedroom	2: Housing physical characteristics 3: Neighborhood characteristics	0.034 –0.004	$p > 0.05$ $p > 0.05$	0.10 0.42	No statistically significant effect across model steps; increases in R^2 likely due to other variables.
Huang (2015a)	House area (m^2)	2: Housing characteristics 3: Neighborhood characteristics 4: Public facilities 5: Social environment 6: Housing allocation scheme 7: Residence comparison	0.018 0.018 0.021 0.021 0.017 0.026	$p < 0.05$ $p < 0.05$ $p < 0.001$ $p < 0.001$ $p < 0.05$ $p < 0.001$	0.04 0.13 0.18 0.18 0.21 0.35	Effect remains stable across model steps; minor changes in coefficients; consistently significant.
Huang (2015a)	Number of bed-rooms	2: Housing characteristics 3: Neighborhood characteristics 4: Public facilities 5: Social environment 6: Housing allocation scheme 7: Residence comparison	–0.057 0.0217 –0.079 –0.081 0.332 –0.131	$p > 0.15$ $p > 0.15$ $p > 0.15$ $p > 0.15$ $p > 0.15$ $p > 0.15$	0.04 0.13 0.18 0.18 0.21 0.35	No statistically significant effect across model steps; increases in R^2 likely due to other variables.
Huang (2015b)	House area (m^2)	2: Housing characteristics 3: Neighborhood characteristics 4: Individual and household characteristics	0.11 0.11 0.13	$p < 0.01$ $p < 0.01$ $p < 0.01$	0.138 0.160 0.161	Effect remains stable across model steps; minor changes in coefficients; consistently significant.
Nguyen (2017)	Living size (m^2)	3: Physical attributes of apartments 4: Subjective evaluation of apartments	0.00 0.00	$p > 0.1$ $p > 0.1$	0.103 0.470	No statistically significant effect across model steps; increases in R^2 likely due to other variables.
Nguyen (2017)	Number of rooms	3: Physical attributes of apartments 4: Subjective evaluation of apartments	–0.03 –0.02	$p > 0.1$ $p > 0.1$	0.103 0.470	No statistically significant effect across model steps; increases in R^2 likely due to other variables.
Salas (2019)	Crowding	1: Baseline model (Crowding t, t-1) 2: Income & overcrowding controls 3: Average crowding (context variable)	–0.101 –0.100 –0.104	$p < 0.01$ $p < 0.01$ $p < 0.01$	not reported	Effect remains stable across model steps; minor changes in coefficients; consistently significant.
Tao (2014)	Usage area per person	1: General factors 2: Specific characteristics of migrant workers 3: Institutional characteristics	0.01 0.00 0.00	$p > 0.01$ $p > 0.01$ $p > 0.01$	0.17 0.26 0.26	No statistically significant effect across model steps; increases in R^2 likely due to other variables.
Zeng (2020)	Size (m^2)	2: Housing characteristics 3: Neighborhood and location characteristics	1.863 1.812	$p < 0.01$ $p < 0.01$	0.19 0.22	Effect remains stable across model steps; minor changes in coefficients; consistently significant.

age-related differences: younger tenants benefited more at low satisfaction levels, while older tenants benefited more at very high levels. Huang et al. (2015b), on the other hand, found only minor differences by gender, age, and income. Galster (1987) and Foye (2017) made it clear that family constellations (e.g., female-headed households, households with small children) and gender can influence the effect curve and saturation points/threshold values. Finally, Salas and Vigorito (2019) showed that the relevance of living space can change over time: despite lower occupancy density, the negative influence of crowding increased between 2004/06 and 2006/11.

Analysis of these subgroup findings suggests that the relationship between living space and housing/residential satisfaction varies depending on the group and context. Furthermore, differences between the studies indicate that the findings are influenced not only by

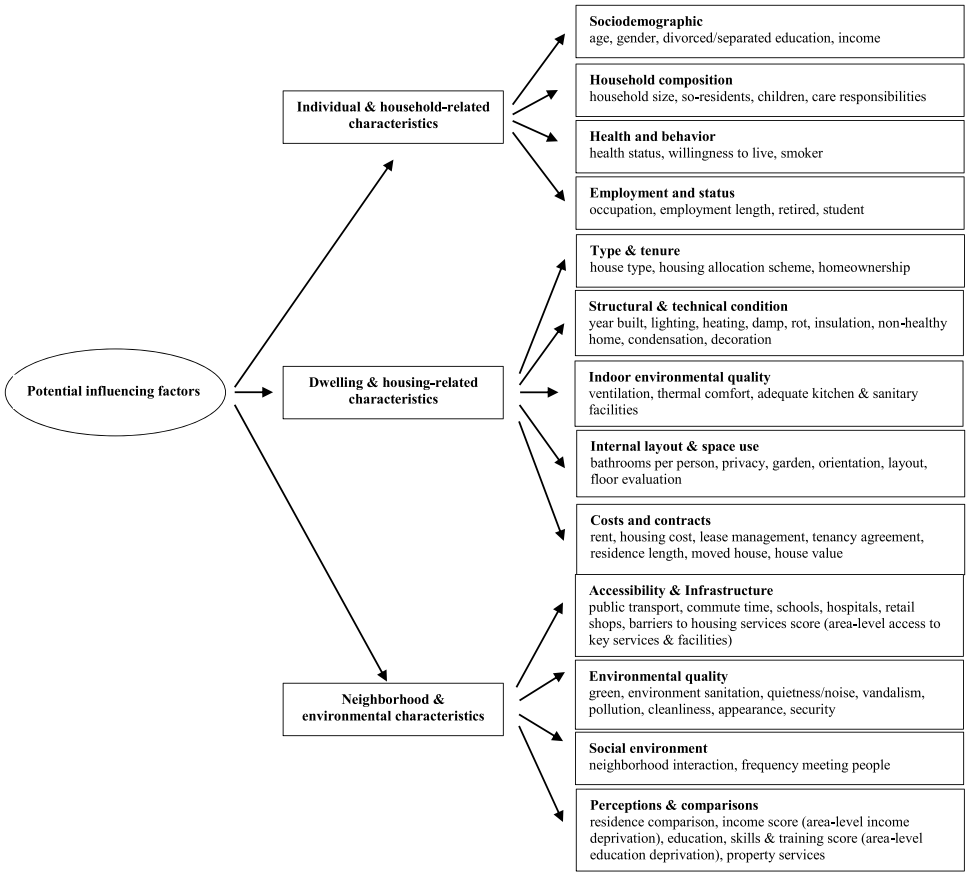


Fig. 5. Overview of potential influencing factors identified in the reviewed studies.

contextual conditions (e.g., the time frame of the survey) and methodological aspects, but also by the composition of the samples studied. The subgroup analyses suggest that such variation may stem from temporal context, the definition of subgroup structures and housing categories, and differences in age, gender, or household composition. Differences in findings may therefore also be attributable to the specific populations under study rather than to contextual or methodological variation alone.

6. Discussion

The aim of this review was to (1) examine and describe the relationship between per-person living space or occupancy density and housing/residential satisfaction, and (2) identify potential factors influencing this relationship. To this end, 18 primary studies were analyzed that considered either housing satisfaction or residential satisfaction as the dependent variable. Subgroup analyses in individual studies resulted in 26 entries being included in the data mapping instead of 18.

Previous research on this topic has mainly taken the form of individual, context-specific studies in which living space or occupancy density was considered as just one of many variables (Dimuna and Olotuah, 2019; Ibem and Aduwo, 2013; Mohit et al., 2010; Galster, 1985; Salleh, 2008). Studies on the relationship between housing conditions (e.g., space availability, overcrowding) and health (e.g., mental stress, infectious diseases) (Bonnefoy, 2007; Booth and Cowell, 1976; Evans et al., 2000b; Kearns, 2022) or global housing trends (e.g., increasing living space) (Lamb et al., 2021) highlight the relevance of housing conditions, but do not systematically focus on housing/-residential satisfaction. This made it difficult to draw more general conclusions and underscored the need for a targeted systematic review. This review provides the first overview of the indicators used in the literature for living space and occupancy density, their operationalization, and the reported statistical correlations with housing satisfaction and residential satisfaction.

6.1. Main findings on living space, occupancy density, and housing/residential satisfaction

The analysis of regression models showed that larger living spaces and lower occupancy densities are predominantly positively associated with housing satisfaction or residential satisfaction. This applies to both absolute space measurements such as total floor area (Azimi and Esmaeilz-adeh, 2017; Huang and Du, 2015a; Huang et al., 2015b; Nguyen et al., 2017, 2019; Pongpraesert and Chatrkaw, 2023), the number of rooms (Nguyen et al., 2017, 2019), or the number of bedrooms (Ahn and Lee, 2016; Azimi and Esmaeilzadeh, 2017; Huang and Du, 2015a; Ibem et al., 2019; Lee et al., 2021; Noor et al., 2014) as well as to relative measures such as floor area per person (Li et al., 2019; Tao et al., 2014; Zeng et al., 2020), rooms per person (Foye, 2017; Galster, 1987), persons per room (Azimi and Esmaeilzadeh, 2017; Salas and Vigorito, 2019) or persons per bedroom (Freeman and Manturuk, 2019). Assuming a consistent interpretation (i.e., more living space = potentially higher satisfaction), none of the included studies showed any significant negative effects. The most frequent significantly positive correlations with satisfaction were found for total floor area (Huang and Du, 2015a; Huang et al., 2015b; Pongpraesert and Chatrkaw, 2023) and for rooms per person (Foye, 2017; Galster, 1987).

Another indication of the positive correlation between larger living space per person and lower occupancy density on housing/residential satisfaction was found by linking the satisfaction scores reported in the studies. The standardized satisfaction values (0–1) showed an overall positive trend in relation to living space per capita, while higher

Table 15
Subgroup analyses – moderating effects on the living-space-satisfaction relationship (significant results only).

study/subgroup	indicator	linear (B/ß)	square ($B^2/ß^2$)	p-values/sig.	threshold value	deviation from full sample
Galster (1987) – full sample	**rooms/person**	**0.28**	**–0.26**	*, *	**3,47–4.61**	**reference**
income $0–25,000	rooms/person	0.41	–0.39	*, **	3.57–4.39	slightly more satisfied
education 0–12 years	rooms/person	0.35	–0.41	n.s., *	–	similarly satisfied
female head of household	rooms/person	0.87	–0.66	***, ***	3.77–4.33	considerably more satisfied
youngest child in household < age 5	rooms/person	0.96	–0.74	**, **	2.09–2.32	much more satisfied
youngest child in household > age 14	rooms/person	0.79	–	***	–	considerably more satisfied
Foye (2017)						
males	rooms/person	0.544	–0.0747	***	3.6	slightly more satisfied than females, lower threshold
females	rooms/person	0.464	–0.0591	***	3.9	slightly less satisfied than males, higher threshold
Huang (2015a) – full sample	**sqm**	**0.026**	**–**	***	**–**	**reference**
monetary subsidized housing	sqm	0.077	–	***	–	considerably more satisfied
economic comfortable housing	sqm	0.031	–	*	–	slightly more satisfied
public rental housing	sqm	0.063	–	+	–	considerably more satisfied
cheap rental housing	sqm	0.129	–	+	–	much more satisfied
Huang (2015b) – full sample	**sqm**	**0.13**	**–**	***	**–**	**reference**
male	sqm	0.12	–	***	–	slightly less satisfied
female	sqm	0.15	–	***	–	slightly more satisfied
younger generation	sqm	0.12	–	***	–	slightly less satisfied
older generation	sqm	0.16	–	***	–	slightly more satisfied
low income	sqm	0.10	–	***	–	less satisfied
high income	sqm	0.15	–	***	–	slightly more satisfied
Li (2019)[1] – full sample	**sqm/person**	**–0.263, 0.271, 0.325, 0.535**	**–**	**n.s., n.s., ***, *** **	**–**	**reference**
young tenants	sqm/person	0.724, 0.398, 0.392	–	**, **, n.s.	–	stronger effects at low satisfaction levels
elderly tenants	sqm/person	0.171, 0.152, 0.915	–	n.s., n.s., ***	–	stronger effects at high satisfaction levels only
Salas (2019)						
2004/2006	persons/room	–0.083	–	***	–	less negative effect = more satisfied than 2006/2011
2006/2011	persons/room	–0.178	–	***	–	more negative effect = less satisfied than 2004/2006

*p < 0,1; **p < 0,05, ***p < 0.01.
+p < 0.15.
[1] Note. In the full sample, four satisfaction cut-offs were modeled. In the subgroup models, the first two categories ("very dissatisfied" and "dissatisfied") were merged, resulting in three cut-offs.

occupancy densities – measured as persons per [bed]room – were predominantly associated with lower satisfaction. Although the point distributions indicated a certain degree of dispersion, overall there was a consistent positive correlation between larger living space, lower occupancy density, and higher satisfaction. These findings are consistent with earlier individual studies, which also report a positive correlation between larger living space and higher satisfaction, and between higher occupancy density and lower satisfaction (Dinç et al., 2013; Kleeman et al., 2022; Labin et al., 2023; Sa-deghlou and Emami, 2023; Wang and Wang, 2020; Zhang et al., 2018; Żelazowski et al., 2022).

At the same time, other findings point to saturation effects. Galster (1987) reported that, taking the entire sample into account, the positive influence of additional rooms only increased up to 3.5 to 4.6 rooms per person, while Foye (2017) observed a plateau at 3.6 to 3.9 rooms per person. A similar pattern was found in a study by Zhao et al. (2022), which examined the influence of room design in student residences. Satisfaction increased with increasing per capita living space, but this effect weakened at a living space of around 13.5 m^2 per person. These results thus suggest that the perception of living space is not only linear, but that saturation effects can occur. Systematic analyses of such patterns have been largely absent from broader housing/residential satisfaction research to date.

6.2. Contextual, subgroup-related, and temporal influences

Regarding the second research question – which factors influence the relationship between living space or occupancy density and housing/residential satisfaction – it was found that no explicit interaction tests between living space and potential covariates were performed in the included studies. The analysis of stepwise models (Baiden et al., 2011; Freeman and Manturuk, 2019; Huang and Du, 2015a; Huang et al., 2015b; Nguyen et al., 2017; Salas and Vigorito, 2019; Tao et al., 2014; Zeng et al., 2020) showed that the effects of space indicators remain largely stable within individual studies, even when additional covariates are successively added in consecutive model stages (Table 14). This tends to argue against pronounced context dependency at this level.

Potential influencing factors could therefore only be identified indirectly, in particular through subgroup analyses that examined differences according to housing type (Azimi and Esmaeilzadeh, 2017), gender (Foye, 2017; Galster, 1987; Huang et al., 2015b), income (Galster, 1987; Huang et al., 2015b), education (Galster, 1987), age (Galster, 1987; Li et al., 2019), households with children of different ages (Galster, 1987), ownership status (Freeman and Manturuk, 2019), housing allocation and financing schemes (Huang and Du, 2015a), and temporal survey aspects (Salas and Vigorito, 2019). Some studies also selected explicit population groups in the context of their research question, such as people from low-income households (Freeman and Manturuk, 2019), homeowners (Galster, 1987), older people living in rural areas (Lee et al., 2021), families with children (Salas and Vigorito, 2019), and migrants (Tao et al., 2014; Zeng et al., 2020). The results of the subgroup analyses were heterogeneous: while the effect sizes varied between individual groups and the overall sample, significant correlations were consistently positive within the included studies. In addition, some comparative findings point to potentially robust associations across different settings: Caffaro et al. (2019) found a similar pattern in the relationship between housing conditions and housing-related subjective well-being (HRSWB) in Turin and Havana, despite considerable differences in living standards and socio-cultural organization. Likewise, Evans et al. (2000a) found an association between lack of living space and increased psychological distress among various cultural groups in the USA. These findings suggest a recurring pattern across countries and contexts within the pool of 18 studies included in this review; however, this interpretation should be treated with caution given the limited and heterogeneous evidence base. At most, the available evidence suggests that insufficient per-person living space may be perceived similarly across some contexts, while variation in effect strength may additionally reflect methodological or sampling-related differences. At the same time, the generalizability of these findings remains limited by the geographical concentration of the included studies, most of which were conducted in East and Southeast Asia. Because housing norms, urban density, and cultural expectations of residential space differ substantially across regions, the observed patterns cannot be assumed to apply equally to other settings. This interpretation is supported by a recent review that summarizes international findings from various regions (including the UK, Canada, New Zealand, Ghana, Sweden, and Spain). Curtis and Riva (2023) showed that although subjective assessments vary, recurring links can be identified in the relationship between the material and psychosocial dimensions of living spaces and well-being, despite cultural differences. Furthermore, historical analyses using London as an example illustrate that national space standards and housing policy guidelines have a significant influence on what is considered adequate living space and how these shape social expectations of housing (Alonso Aranda, 2024). Another influencing factor is the timing of data collection, as shown by Salas and Vigorito (2019), who accounted for multiple survey years in their regression analysis.

6.3. Conceptual distinction and measurement of housing and residential satisfaction

A further source of heterogeneity concerns the conceptualization and measurement of the dependent variable. A key finding of this review was the considerable heterogeneity of the included studies, which limits direct comparisons and reliable conclusions. For example, different regression methods were used, such as OLS, binary or ordinal logistic regressions, 2SLS, GOLM, or CATREG.

As Lu (1999) showed, different model approaches can reveal similar patterns, but sometimes lead to differing effect sizes and significance levels, which further complicates interpretation.

Further inconsistency existed in the dependent variable: although its measurement was clear in most studies and allowed for a clear assignment to housing satisfaction or residential satisfaction, there were differences in its operationalization due to varying scales (e.g., 3-, 5-, 7-, or 11-point Likert scales). In addition, there was conceptual ambiguity: while some studies narrowly defined housing satisfaction as satisfaction with housing-related characteristics (e.g., size, amenities), others – sometimes even under the same name – also included neighborhood and environmental factors. For instance, in the work of Freeman and Manturuk (2019), Foye (2017), and Nguyen et al. (2019), a striking proportion of explanatory variables could be attributed to the neighborhood and environment domain – in some cases even to the same or greater extent as housing-related predictors (Table 5). It should be noted, however, that in the study by Foye (2017), housing satisfaction was not considered in isolation, but was modeled in parallel with life satisfaction and GHQ caseness (the presence of psychological distress as defined by the General Heath Questionnaire threshold). This simultaneous analysis points to an expanded conceptual understanding in which housing/residential satisfaction is not seen as a singular target variable, but rather as part of a comprehensive set of life circumstances. Against this backdrop, the broad analytical approach with a multitude of influencing factors – including neighborhood aspects – appears methodologically comprehensible and theoretically consistent. The study by Freeman and Manturuk (2019) also requires a differentiated consideration. The authors worked with a three-step regression model in which neighborhood-related variables were additionally included in the final model stage – to an extent that exceeds the number of housing-related predictors. Although the survey question explicitly refers to the dwelling (How would you rate your dwelling as a place to live?), no terminological distinction is made between housing satisfaction and residential satisfaction.

This illustrates that the conceptual distinction between housing satisfaction and residential satisfaction is not always consistently applied in empirical research, but can be interpreted differently

depending on the study design and research interests – even though the wording of the survey question allows for a relatively clear assignment of the target variable in most cases. This points to the multidimensionality of the construct described in the literature: while housing satisfaction often refers to the evaluation of physical dwelling characteristics (e.g., size, amenities) (Lu, 1999; Maggino, 2024; Saleem and Alchalabi 2025; Weidemann and Anderson, 1985), residential satisfaction extends to social, economic, and neighborhood-related dimensions (Aigbavboa and Thwala, 2016; Amérigo and Aragonés, 1997; Clapham et al., 2017; Mohit and Azim, 2012; Mridha, 2023).

The two constructs were nevertheless analyzed together because the empirical literature does not apply the distinction consistently and because restricting the review to only one of the two outcomes would likely have narrowed the available evidence considerably. At the same time, the broader conceptual scope of residential satisfaction means that neighborhood and environmental factors may be incorporated more strongly in some studies, which may further affect comparability. However, given the limited number of studies and the considerable heterogeneity of concepts, measures, and models, the present review does not allow for robust conclusions as to whether the relationship between space-related indicators and satisfaction systematically differs between housing satisfaction and residential satisfaction.

6.4. Design-related factors beyond quantitative space indicators

Despite this theoretical breadth of the concept of housing/residential satisfaction, the qualitative design of the interior was rarely taken into account in the studies analyzed. Ahn and Lee (2016) and Li et al. (2019) understand housing quality primarily as structural adequacy according to technical standards, for example with regard to sanitation, heating, and electrical systems, or the general building fabric. Lee et al. (2021) emphasize health and safety-related dimensions with the concept of a healthy home, such as the absence of sources of danger or hygienic living conditions. An explicit interior design aspect can be found in the consideration of room layout or floor plan: Li et al. (2019) address this under the variable housing design, while Pongpraesert and Chatrkaw (2023) examine the factor layout of the house in the context of home offices. In both cases, there are significant positive effects on residential satisfaction. Finally, the study by Huang et al. (2015b) is the only one that explicitly includes aesthetic quality by referring to design and atmospheric features with the variable “decoration,” which also has a significant positive effect. What these studies have in common is that they consider design aspects largely independently of quantitative living space indicators. It remains unclear whether and to what extent design features can mitigate the negative effects of low “space availability” or moderate the relationship between living space or occupancy density and satisfaction. Evidence of such potential is provided by supplementary studies outside the scope of this review. Rollings and Evans (2019) and Evans et al. (1996) show that architectural features such as room depth or ceiling height can mitigate the negative effects of high occupancy density or perceived crampedness on psychological and physiological well-being. Further studies show that interior design can have a positive influence on residential satisfaction and well-being (Jain and Bhandari, 2024; Obeidat and Obeidat, 2024).

6.5. Living space indicators, harmonization, and methodological heterogeneity

In line with the first research question, this review focused on quantitative space indicators such as living space per person or occupancy density. However, even within this clearly defined framework, there was methodological diversity: although all indicators consistently reflected the availability of rooms or housing size, the terms used (e.g., structure size, per capita living space, crowding, usage area per person) and their operationalizations varied. For the analysis, these terms were harmonized and, in some cases, the corresponding values were derived mathematically. One methodological peculiarity concerns the study by Foye (2017). Strictly speaking, it should have been excluded according to the defined inclusion criteria, as the central space indicator (rooms per person) was only reported as a median, and thus no direct conversion into other indicators such as persons per room was possible. This made it impossible to determine clearly how much living space was actually available per person. Nevertheless, the study was included in the review because it was the only one that met the other inclusion criteria and explicitly treated the relationship between living space and housing satisfaction as its primary research topic.

Despite considerable conceptual and methodological heterogeneity – for example, in definitions, measurement instruments, and analysis methods – the included studies suggest a recurring pattern in which per-person living space and occupancy density appear to be relevant factors for housing/residential satisfaction across a range of contexts, although this pattern should be interpreted cautiously given the limited and geographically uneven evidence base. The overview illustrates which indicators have been used to date and how they have been operationalized, while also highlighting the existing methodological differences. More living space and lower occupancy are predominantly positively associated with housing/residential satisfaction, although the strength of the correlation varies depending on the context. However, this alone may not be sufficient, as it remains unclear whether architectural or interior design features can mitigate or compensate for the negative effects of limited living space. This underexplored aspect should be systematically addressed in future studies.

The findings of this review not only provide insights into key influencing factors, but also underscore the need for clearer distinctions, uniform measurement units, and consistent analysis models in order to increase the comparability of future research and enable sound guidance for practice and policy.

6.6. Limitations

This review has several limitations that should be taken into account when interpreting the results.

The significance of the findings is limited by the very small number of primary studies included ($n = 18$). Such a small evidence base makes it difficult to draw robust and generalizable conclusions, and broader cross-contextual patterns should therefore be interpreted with caution, as individual studies can have a relatively strong influence on the results.

There is considerable heterogeneity in the content and methodology of the included studies. Differences can be seen in the use, collection, measurement, and operationalization of the dependent variables housing satisfaction and residential satisfaction, which are the focus of this review, as well as of independent variables that reflect the amount of space available in the dwellings (e.g., living space per capita, total housing size, number of [bed]rooms, persons per [bed]room, rooms per person).

In many primary studies, no direct measurements of occupancy density or per capita living space were available. In these cases, approximate values were either determined from reported interval or limit values (e.g., 61–80 m^2; >…) or derived from the arithmetic mean of other indicators specified in the paper (e.g., total housing size divided by household size). Such methods carry the risk of measurement inaccuracies and biases that may limit the comparability of the results.

Potential differences in the counting of rooms (e.g., inclusion or exclusion of kitchens or rooms below a certain minimum size) and household members (e.g., full or proportional inclusion of young children) could not be taken into account due to a lack of clear definitions in the primary studies. However, based on international comparative data, it can be assumed that there are no uniform standards even among the countries included in the studies. Such possible differences, combined with the use of the aforementioned approximations, may further limit comparability.

Some studies lacked statistical parameters or the information required to calculate them (e.g., standardized regression coefficients, standard deviations, odds ratios). Without this information, it was not possible to systematically compare the effect sizes. In addition, some of the primary studies differed in the significance levels used, which further complicated the comparability of the reported effects.

The focus was on studies that reported a quantitative relationship between per-person living space or occupancy density and housing/residential satisfaction, and that reported regression coefficients (standardized or non-standardized) of the independent variable. Studies that reported only correlations or group differences (e.g., using correlations or *t*-tests) without regression-based effect analyses or that provided purely descriptive statistics were not included. Qualitative research that could provide in-depth insights into perceptions, cultural differences, or individual adaptation strategies was also not systematically included. As a result, potentially important contextual information was not available, and the resulting evidence base may underrepresent research traditions in which non-regression approaches are more common.

Only published studies were analyzed, so publication bias cannot be ruled out. In addition, most of the included studies used cross-sectional data, which meant that no causal conclusions could be drawn about the direction of causality of the observed correlations. This also means that reverse or selective pathways cannot be ruled out; for example, households with higher satisfaction may be more likely to live in or move into larger dwellings, rather than larger dwellings necessarily causing higher satisfaction. Long-term changes in living situations and satisfaction were only recorded in a few longitudinal analyses. Furthermore, the surveys on housing/residential satisfaction in all included studies were based on self-reported information. Such subjective assessments are susceptible to response bias (e.g., social desirability, culturally different response tendencies, or mood-dependent judgments) and may limit the comparability between studies and contexts.

It should be noted that the most recent study included in this review was published in 2023 and that the last database search was conducted on February 16, 2025. It is therefore possible that further relevant studies have been published or are currently undergoing peer review but were not included in the search strategy for this review.

The geographical distribution of the included studies is uneven. There is a clear focus on East and Southeast Asia, followed by North America, while other regions (such as Europe, Africa, and South America) are only represented sporadically. This uneven coverage may limit the transferability of the results, as housing norms, urban density, and cultural expectations of residential space may differ substantially across regions.

Finally, only studies in English were considered, which potentially limits the international applicability of the results.

7. Conclusions

The aim of this review was to examine the current state of knowledge regarding (1) the relationship between per-person living space or occupancy density and housing/residential satisfaction and (2) potential factors influencing this relationship. The analysis of 18 international primary studies shows that larger living spaces and a higher number of rooms – in absolute terms or relative to household size – are predominantly positively associated with housing satisfaction or residential satisfaction; no negative effects were reported. However, the influence is not equally pronounced in all contexts. While the effects of space indicators remain largely stable in stepwise models, subgroup analyses and differences between the primary studies show that the relationship varies in certain population groups (e.g., by age, gender, or household constellation) and under specific conditions (e.g., time of survey). Additional covariates primarily capture independent aspects of housing/residential satisfaction without significantly altering the effect. It should be noted that individual studies were designed from the outset to focus on specific population groups (e.g., low-income households, older people, families with children), so that differences in the findings are partly attributable to these targeted samples. Furthermore, individual studies suggest that more living space or rooms does not necessarily lead to greater well-being, but that saturation effects or threshold values may exist.

This review provides the first systematic presentation of the indicators used in the literature for living space and occupancy density, as well as their operationalization. The findings highlight the need for clear conceptual definitions – both for indicators of living space and occupancy density (e.g., counting methods for rooms, inclusion of household members or specification of household size) as well as for the underlying understanding of housing satisfaction and residential satisfaction (e.g., differentiation from related concepts, dimensions taken into account) – as well as for uniform measurement instruments and complete reporting in order to create a robust evidence base. Standardization of indicators (e.g., [bed]rooms/person, m^2/person, persons/[bed]rooms), the use of validated, multidimensional satisfaction scales, and the harmonization of analysis models would help to improve comparability between studies and contexts. Overall, the review shows that living space and occupancy density are relevant but not solely decisive predictors of housing satisfaction and residential satisfaction. Against this background, this review provides an important starting point for future research that examines these relationships in a more differentiated manner and takes relevant contextual factors into account.

7.1. Implications for practice and policy

The correlations identified in this review between living space and occupancy density on the one hand and housing/residential satisfaction on the other provide valuable starting points for planners, housing associations, architects, social services, and policymakers. Although the average living space per capita is trending upward worldwide, this increase is unevenly distributed (Lamb et al., 2021), with low-income households and certain regions in particular continuing to be affected by cramped living conditions (Ahmad et al., 2025; Nkosi et al., 2019). The findings suggest that adequate space per person is a key component of needs-based construction and renovation, with complementary factors such as infrastructure, safety, and environmental quality playing an equally important role. In practice and policy, this means that housing strategies should not be based solely on square meters or room standards, but should also take into account social, economic, and urban planning conditions.

At the same time, the results show that the effects of living space availability and occupancy density are not the same across all population groups or under different conditions. Housing policy measures should therefore respond in a differentiated manner to the needs of specific target groups. Since many of the available studies focused on specific population groups, such as low-income households, older people, and families with children, the findings suggest that interventions should be tailored more closely to their respective life situations.

International differences and cultural preferences further indicate that recommended minimum standards can provide guidance, but must be flexibly adapted to local conditions. In countries with low per capita living space or high occupancy density, policymakers should prioritize ensuring minimum standards of human dignity, for example through clearly defined space or room standards per person combined with measures to promote affordability and improve the living environment. In more affluent contexts, by contrast, the focus is increasingly on limiting excessive living space and reducing environmental impacts. Although more living space can increase satisfaction, it is often associated with increased material and energy consumption (Das et al., 2022). Against the backdrop of decent living conditions, international climate protection goals, and the commitment to resource-efficient development, housing strategies should therefore seek to ensure basic standards on the one hand while limiting excessive space on the other. The overall challenge is to balance quality of life and sustainability, for example

through sufficiency-oriented living spaces, sharing concepts, and qualitative improvements to the living environment.

7.2. Implications for research

Future research should examine the relationship between living space availability or occupancy density and housing/residential satisfaction more explicitly as a primary research topic, since only a few studies to date, such as Foye (2017) and Lévy-Leboyer and Ratiu (1993), have placed this issue at the center of their analysis. To ensure comparability of findings, both the central indicators (e.g., how rooms are counted or which household members are included) and the underlying concept of housing/residential satisfaction (e.g., its distinction from related constructs and the dimensions it covers) require clear and consistent definitions. In addition, research should converge on a limited number of clearly operationalized measures of living space availability in order to reduce the current diversity of indicators. On this basis, validated multidimensional satisfaction scales should be used, analytical models should be harmonized, and key statistical parameters (e.g., means, standard deviations, standardized regression coefficients) should be reported transparently. Care should also be taken to label these parameters correctly in order to avoid misunderstandings. Moreover, potential contextual factors and individual characteristics should not only be modeled as control variables, but also examined with regard to their moderating effects on the relationship between living space availability or occupancy density and housing/residential satisfaction. This should include additional contextual indicators, such as climate-related conditions, cultural expectations, and historical housing/residential traditions, in order to support a more nuanced and comprehensive understanding of how home size may influence housing/residential satisfaction across settings. Such efforts may also contribute to the development of more comprehensive and robust evaluation models. Finally, nonlinear effects and threshold values should be investigated explicitly in order to identify possible saturation effects, such as diminishing returns of additional living space beyond a certain level. Future research should also integrate the role of interior design more systematically into the relationship between living space availability, occupancy density, and housing satisfaction. The existing literature provides initial indications that design features, such as ceiling height, room depth, layout, or aesthetic elements, may influence perceived density and crampedness. However, empirical evidence is still lacking as to whether such features can compensate for or moderate the effects of limited space.

7.3. Implications for education

The results of this review underscore the relevance of living space and occupancy density as integral components of education in disciplines such as urban and regional planning, architecture, social work, public health, and energy and policy consulting. Study programs in these areas should focus more on the link between objective living conditions, subjective satisfaction with housing, and overarching social goals such as resource equity and climate protection. Interdisciplinary educational formats that combine approaches from sociology, environmental sciences, psychology, and construction disciplines could help sensitize future professionals to the complex interactions between living space, quality of life, and sustainability. Practical case studies and international comparative perspectives should be used to raise awareness of cultural differences and social inequalities in housing conditions.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of generative AI and AI-assisted technologies in the manuscript preparation process

During the preparation of this work, the authors used ChatGPT, Copilot, and DeepL to improve language and readability. After using these tools, the authors reviewed and edited the content as needed and take full responsibility for the publication's content.

Ethics in publishing statement

I testify on behalf of all co-authors that our article submitted followed ethical principles in publishing.

Title: Dimensions of housing – Influence of per-person living space and occupancy density on housing satisfaction and residential satisfaction: A scoping review

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All authors have been personally and actively involved in substantive work leading to the manuscript and will hold themselves jointly and individually responsible for its content.

CRediT authorship contribution statement

Nadine Nebel: Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Stefanie Rümpel:** Validation, Resources, Investigation. **Sabine D. Klein:** Methodology. **Alina Huldtgren:** Writing – review & editing, Supervision. **Eike Musall:** Writing – review & editing, Supervision. **Marcel Schweiker:** Writing – review & editing, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The authors acknowledge support for the publication costs by the Open Access Publication Fund of RWTH Aachen University.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.wss.2026.100429.

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