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Garcia-Antunez, Oriol

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Gardening for wildlife: A mixed-methods exploration of the factors underlying engagement in wildlife-friendly gardening

Oriol García-Antúnez¹  | Jens Lindgaard¹ | Jussi Lampinen^{2,3}  | Anton Stahl Olafsson¹ 

¹Department of Geosciences and Natural Resource Management, Faculty of Science, University of Copenhagen, Frederiksberg C, Denmark

²Department of Economics and Management, Faculty of Agriculture and Forestry, University of Helsinki, Helsinki, Finland

³Helsinki Institute of Sustainability Science, University of Helsinki, Helsinki, Finland

Correspondence

Oriol García-Antúnez
Email: oga@ign.ku.dk

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Abstract

1. Private domestic gardens have immense potential to contribute to urban biodiversity conservation. However, they are divided into small private plots and managed individually by garden owners. Therefore, engagement in wildlife-friendly gardening (WFG), which entails alternative management and design choices, relies on the individual willingness of each garden owner.
2. Using an online survey and qualitative walking interviews with garden owners, our study explores individual internal and external factors underlying engagement in WFG. We interpret and reflect on our findings in the context of gardening as a relational practice between people and nature.
3. Our findings suggest that motivations for gardening play a central role in how internal and external factors promote or impede WFG. For example, motivations towards organic gardening and learning from nature promote WFG, whereas personal and family care and well-being motivations seem to impede it.
4. The perceived and actual garden area, as well as self-reported insufficient knowledge and social norms, covary the most with engagement in WFG. Engagement in WFG relates to people's relationships with nature, as embodied in social norms of community acceptance and cohesion, and care and respect for nature and others.
5. Future research into pro-environmental behaviours in gardens should adopt more relational approaches that go beyond the individual self and take better account of feedback between individual actions and social relations.

KEYWORDS

pro-environmental behaviour, relational values, socio-ecological systems, stakeholder engagement, urban ecology, wildlife-friendly gardening

1 | INTRODUCTION

Private domestic gardens are integral to cities and urban ecosystems. For example, they account for an estimated 27.4% of the urban area of Edinburgh, UK (Loram et al., 2007), 23% of Sheffield, UK (Gaston et al., 2005), and up to 36% of Dunedin, New Zealand

(Mathieu et al., 2007). Because domestic gardens are generally divided and dispersed across multiple small private properties, governments have difficulty enforcing guidelines that might harness private gardens to policy goals regarding biodiversity loss (e.g. CBD, 2021) or conservation (Dewaelheyns et al., 2016). Nonetheless, thanks to the large amount of time invested in gardening, the yearly

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household expenditure on gardening and garden products—400 EUR in Denmark in 2020 (Statistics Denmark, 2022a)—and gardens' extensive share of total urban land area, private domestic gardens have immense potential to contribute to urban biodiversity conservation (Goddard et al., 2010).

Thompson (2007) distinguishes between conventional and near-nature gardening, which he places at either end of a continuum. Near-nature gardening—also called differential management (Aggeri, 2010), ecologically sustainable gardening practices (Kiesling & Manning, 2010) and wildlife-friendly gardening (WFG) (Goddard et al., 2010)—aims to support wildlife by providing a wide range of ecological resources (Davies et al., 2009) and avoiding environmentally aggressive practices such as pesticide use (Shwartz et al., 2013). The direct or expected positive outcomes of WFG practices for the abundance and richness of diverse taxa are well established in the research literature. For example, WFG practices benefit arthropod (Blackmore & Goulson, 2014; Gaston et al., 2005; Lerman et al., 2018; Ro-Poulsen et al., 2018; Threlfall et al., 2017), bird (Cerra & Crain, 2016; Evans et al., 2009; Fuller et al., 2008; Jokimäki, 1999; Paker et al., 2014; Shwartz et al., 2008), amphibian (Gaston et al., 2005), bat (Brittingham & Williams, 2000; Razgour et al., 2010; Russo & Ancillotto, 2014) and plant communities (Perring, 1959; Tresch et al., 2019) (for more evidence, see Warren et al., 2010).

WFG can be conceived as a pro-environmental behaviour, as home gardening and the personal ideologies behind it clearly affect the environmental quality of gardens for wildlife (Kiesling & Manning, 2010; Steg & Vlek, 2009). As with other pro-environmental behaviours, a range of cumulative factors can promote or impede engagement in WFG. According to Kollmuss and Agyeman (2002), barriers arising from sociodemographic (gender, age), internal (e.g. values, motivations, knowledge, responsibility) and external factors (e.g. social norms, structural constraints) need to be overcome for pro-environmental behaviours to be expressed. Recent research has investigated the interplay of sociodemographic, internal and external factors behind pro-environmental home gardening behaviours, including pro-environmental attitudes and beliefs (Shaw et al., 2013; van Heezik et al., 2013), gardening knowledge (Goddard et al., 2013; Lindemann-Matthies & Marty, 2013; van Heezik et al., 2020), gardening motivations and uses (Loram et al., 2011), landscape preferences (Lindemann-Matthies & Marty, 2013; van Heezik et al., 2020) and perceived behavioural feedback (Goddard et al., 2013). Other studies have explored how garden size (Gaston et al., 2007; Smith et al., 2005), gardeners' socioeconomic status (van Heezik et al., 2020) and social norms and expectations (Nassauer, 1998; Nassauer et al., 2009) explain the composition of gardens and gardener engagement in WFG.

Studies seeking to understand how social norms and expectations drive gardening practices argue that gardening is best understood as a stewardship ethic and practice that is essentially relational (Jones & Niemiec, 2020; Mumaw & Mata, 2022) and firmly embedded in social structures and processes (Bhatti, 2014). Few people make personal choices based exclusively on whether things possess inherent worth or satisfy their preferences; instead, they focus on

what is appropriate in the context of their social relationships (Chan et al., 2016)—in this case, relationships with nature and other people within and around their gardens.

Despite this wealth of research on WFG's ecological and social dimensions (Goddard et al., 2013), it is not yet fully understood how behavioural factors and relational values and practices relate to social structures within and around gardens, and how they relate to individual gardeners' motivations and engagement in WFG. Untangling how these factors underpin individual behaviours is critical to foster social acceptance of transformative management practices such as WFG in domestic gardens. Our research explored how individual sociodemographic, internal and external factors promote or impede WFG engagement, and how this might be framed more broadly according to relational thinking (e.g. West et al., 2020). To do so, we first draw on theories on pro-environmental behaviours to quantitatively assess the factors underpinning people's engagement in WFG (Stage 1). Later, we draw on theories on relational thinking, to qualitatively explore how gardening practices are nested in socio-ecological system that expand from individual gardens and gardeners, to gardening as a relational practice between people and nature (Stage 2). Our research questions were twofold, organized chronologically as stages 1 and 2:

Stage 1: how do sociodemographic, internal and external factors covary with WFG engagement?

Stage 2: how are these factors contextualized in socio-ecological domestic garden systems, and how do relational values between people and nature mediate WFG engagement?

A mixed-methods approach, consisting of an online crowdsourced survey and seven qualitative walking interviews with garden owners, provided quantitative and qualitative data to address these questions. Stage 1 assessed the covariance of sociodemographic, internal and external factors with engagement in WFG. Stage 2 contextualized these factors with walking interviews with garden owners, to better describe the effect and interplay of these factors and social structures in promoting or impeding WFG engagement.

2 | METHODS

Due to the mixed-methods nature of this study, the data collection and analysis were divided into two chronological stages. Stage 1 collected quantitative data through an online survey; stage 2 consisted of seven qualitative, semi-structured walking interviews with garden owners. We will present the results from the two stages separately, but our discussion will draw them together to address our research questions (Creswell & Clark, 2017).

2.1 | Stage 1: Online survey

We began with an online survey to collect quantitative data on WFG engagement and the factors that promoted or impeded it (Table 1). We assessed WFG engagement using a set of 19 garden

TABLE 1 Survey sections and questions used in this study.

Survey element	Question/statement	Question type, response options
WFG engagement	Which of the following features are present to any extent in your garden? <i>Mounds with vegetation or stones</i> ‡ <i>Patches of bare soil</i> ‡ <i>Terrain wall of natural stone</i> * <i>Gravel path</i> * <i>Nest sites for insects (e.g. insect hotels)</i> ‡ <i>Uncut grass</i> † <i>Bird attractions (e.g. bird bath, box and/or feeders)</i> ‡ <i>Dense shrubs and undergrowth</i> * <i>Different heights of connected vegetation from ground to treetop</i> * <i>Rain garden or pond, with diverse perennials, stones and other flowering plants in my lawn</i> * <i>Old trees and stones with lichen and/or moss growing on them</i> † <i>Deadwood e.g. whole tree, tall stump trunks, branches</i> ‡ <i>Leaf litter</i> ‡	Categorical: present, absent, I am not sure
	Which of the following actions are carried out in your garden? <i>I set aside areas for wildlife only, meaning that neither people nor domestic animals have access</i> † <i>I avoid the use of pesticides</i> † <i>I do not weed in some places in the garden</i> † <i>I mow the lawn fewer than three times during a season</i> † <i>I have my own compost heap</i> ‡ <i>I prune my hedges and bushes only between October and December</i> ‡	Categorical: yes, no, I am not sure
Reasons for not engaging in WFG (self-reported barriers)	Bearing your previous answers in mind, what do you think are the reasons why you do not carry out more WFG? <i>Lack of economic resources</i> <i>Neighbourhood norms</i> <i>Lack of WFG knowledge</i> <i>Lack of knowledge about the negative impacts of conventional gardening</i> <i>Health-related issues</i> <i>Ascription of responsibility ('it is not my responsibility')</i> <i>Lack of time</i> <i>Gardening habits ('I have always managed my garden in the same way')</i> <i>Low locus of control ('it does not make a difference')</i> <i>Different landscape preferences</i> <i>Lack of space</i> <i>Other reasons</i>	Multiple choice (maximum of four)/open-ended ('other' option)
Pro-environmental orientations	Revised NEP (Dunlap et al., 2000)	Five-point Likert scale: <i>strongly disagree, disagree, neither agree nor disagree, agree, strongly agree</i>
Garden characteristics	What type of garden do you have?	Categorical nonordered: private garden, allotment garden, shared/community garden, other.
	What is the approximate size of your garden?	Numeric open-ended
Sociodemographic and filtering questions	What is your gender?	Categorical nonordered: female, male, other
	What is your age?	Numeric open-ended
	What is your yearly household income?	Categorical ordered: Under 100,000, 100,001–150,000, 150,001–200,000, 150,001–200,000, 200,001–300,000, 300,001–500,000, over 500,000 (in DKK)
	What is your current job situation?	Categorical nonordered: clerical, supervisor, craftsperson, self-employed, not working, retired, student, other
	Are you following the guidelines/recommendations of a near-nature gardening association?	Categorical: yes, no
	Is your education or job related to nature in any way?	Categorical nonordered: yes, no

Abbreviations: NEP, new ecological paradigm; WFG, wildlife-friendly gardening.

† indicates level of effort 1 (least), ‡ level of effort 2 (medium) and * level of effort 3 (most), according to and inspired by the city of Fredericia's *Vild med vilje* program (Vild med Vilje & Fredericia Kommune, 2020). See [Supporting information S2](#) for the whole survey form.

components based on the literature, encompassing tangible garden features (13) and gardening practices (6) (Supporting information S1). These components, whose implementation demands varying levels of effort, are well established in popular Danish WFG programmes such as *Vild med vilje* ('wild on purpose') and *Giftfri have* ('poison-free garden'). We assessed participants' WFG engagement by asking which of the 19 WFG components were present in their gardens.

Regarding factors that promoted or impeded WFG engagement, we first asked participants to select four out of 11 barriers to pro-environmental action, adapted from Kollmuss and Agyeman (2002). To identify the effect of pro-environmental orientations on WFG engagement, we used the revised new ecological paradigm (NEP) scale developed by Dunlap et al. (2000), which has been used in similar studies (van Heezik et al., 2013). Information on participants' sociodemographic profile (e.g. age, gender, income, occupation) and garden characteristics (e.g. garden type, garden area) was collected at the beginning and end of the questionnaire. We assessed positive attitudes towards WFG programmes by asking whether participants followed any such programme's recommendations. The questionnaire ended with filtering questions and an invitation to participate in stage 2.

As our purpose was to study people that were engaged or interested in WFG, we adopted a convenience sampling strategy in the form of a crowdsourced survey. We used Instagram, LinkedIn and Facebook to distribute a link to the online survey. In addition, we distributed 500 flyers promoting the survey in 20 Greater Copenhagen neighbourhoods. To avoid the overrepresentation of well-off areas, we selected neighbourhoods with differing levels of income, unemployment and education, using data from Copenhagen municipality (City of Copenhagen, 2020). The survey was open from 4 May until 4 June 2020. To increase our response rate, we adopted Shaw et al.'s (2013) proposal and gave survey participants the chance to win a 130 EUR voucher for a local nature shop. Participation was voluntary, and participants could withdraw mid-survey if they so wished. The University of Copenhagen's human research ethics committee did not require a full ethics application to be submitted because the study was deemed low risk.

2.2 | Stage 2: Case study gardens

We complemented the quantitative survey data collected with seven qualitative case studies. The objective of the case studies was to gather nuanced information about how internal and external factors underpinned motivated gardeners' engagement in WFG. Following Flyvbjerg (2006), we used a critical case selection strategy and chose a total of seven gardens from among the 37 participants who expressed an interest in stage 2. The selected gardens were outstanding for their characteristics (e.g. area, WFG components), owner profiles (pro-environmental orientation, age) or inconsistencies between the two.

Between 15 and 19 June 2020, we conducted seven semi-structured walking interviews with garden owners in the relaxed and informal environment of their gardens (Jones et al., 2008; Skår & Krogh, 2009). Interviews lasted between 30 and 60 min. The first minutes consisted of an informal tour of the garden to establish a good rapport with the interviewees (Denzin & Lincoln, 2005). Later, to prompt interviewees to elaborate on their motivations for gardening, we presented them with a word cloud taken from Home et al. (2019). The word cloud contained gardening motivations related to social norms, outdoor recreation and landscape preferences, among others. Then, we asked them to give their opinions and views about specific WFG components, to better capture the barriers to WFG engagement. We concluded by asking general questions about WFG knowledge gaps, WFG programme content, and other perceptions and opinions of WFG. We took notes and recordings of the interviews, as well as pictures of the gardens, with participants' verbal consent to avoid awkward and uneasy situations that could compromise good rapport.

2.3 | Data analysis

First, to assess WFG behaviours, we summarized WFG behavioural data from each garden into a WFG index. As Lindemann-Matthies and Marty (2013) propose, we assigned a value of 1 to each of the 19 WFG components present in each garden. We then added these together to create a compound measure of WFG engagement for each garden, which we called the WFG index. The higher the WFG index, the more wildlife-friendly the garden. Second, to capture the level of effort the gardener had to make to implement each WFG component, we classified the 19 components into three levels of effort. This classification was inspired by collaborative work between *Vild med vilje* and the Danish city of Fredericia (*Vild med Vilje & Fredericia Commune*, 2020). Level of effort 1 included WFG components that were easy to implement (e.g. less weeding, less frequent lawn-mowing), whereas level 3 components required greater effort and commitment (e.g. planting vertically connected vegetation stands, constructing ponds/rain gardens). After assigning each WFG component a level of effort from 1 to 3 (Table 1), we calculated the level of completeness for the three levels of effort for each garden. If a garden presented all the components in effort level 1, that garden scored 100% completeness for that effort level and so on. Regarding pro-environmental orientation, we calculated NEP scores for each garden owner, inverting when needed and adding Likert scale categories (Dunlap et al., 2000). The higher the NEP score, the more pro-environmentally oriented the garden owner.

With Kollmuss and Agyeman's (2002) model of pro-environmental behaviour as a point of departure, we reclassified the predictor variables into sociodemographic, internal and external factors (Table 1). Then, to assess their relative influence on WFG engagement, we built a multiple linear regression model with these three sets of variables as predictors for the WFG index.

Similarly, we built three multiple linear regression models with the same predictors (sociodemographic, internal and external factors) for the completeness of each level of effort. We checked multicollinearity by correlating the candidate predictor variables for the model with one another, and by examining the tolerance and variance inflation factor of the regressions (Hair et al., 2010). We found no evidence of multicollinearity for any of the predictor variables entered in the models. We performed all statistical tests with IBM SPSS 29.

We conducted a thematic analysis of the seven semi-structured interviews (Braun & Clarke, 2006; Creswell, 2014). We deductively identified themes from the audio and written interview material, following Kollmuss and Agyeman's (2002) model of pro-environmental behaviour. After listening to the recorded interviews and reading the field notes, we drafted main themes and subthemes that addressed the research questions, regardless of how recurrent they were (Kiger & Varpio, 2020). Themes that did not fall within Kollmuss and Agyeman's (2002) model were subsequently added to the thematic typology. Once we had finalized a tentative thematic typology, we validated it by revisiting the interview material. Finally, we represented our results in a table with quotes exemplifying each theme.

3 | RESULTS

3.1 | Online survey

The 293 completed responses clustered around highly populated cities such as Copenhagen, Aalborg, Aarhus and Vejle (Figure 1). The majority of responses originated from social media outreach. Of the 500 flyers distributed in Greater Copenhagen, 49 ($\approx 10\%$) were returned completed, which is consistent with similar studies (Shaw et al., 2013; Shaw & Miller, 2016). The majority of survey participants were aged between 35 and 60 years; as is often observed in such studies, females (76.5%) were overrepresented (Hoyle et al., 2017; Raymond et al., 2019). Our sampled population had a median yearly household income of $>500,000$ DKK, compared with Denmark's mean yearly household income of 405,000 DKK in 2020 (Statistics Denmark, 2022b). Of the 293 participants, 47.7% (137) reported that they followed some type of WFG recommendation.

Based on self-reported data on the presence of WFG components, the median WFG index value was 11 (on a range from zero to 19). Avoidance of pesticides (91.8%), presence of leaf litter (85.7%) and bird attractions (78.8%) were the most popular WFG components. Conversely, gravel paths (16%), low-frequency mowing (22.9%) and natural stone terrain walls (27%) were seldom reported (Figure 2).

The questionnaire collected self-reported information on barriers to engagement in WFG (Figure 3). Lack of space (43.7%) and insufficient WFG knowledge (34.8%) were the most frequently reported barriers. Additionally, approximately 20% of respondents

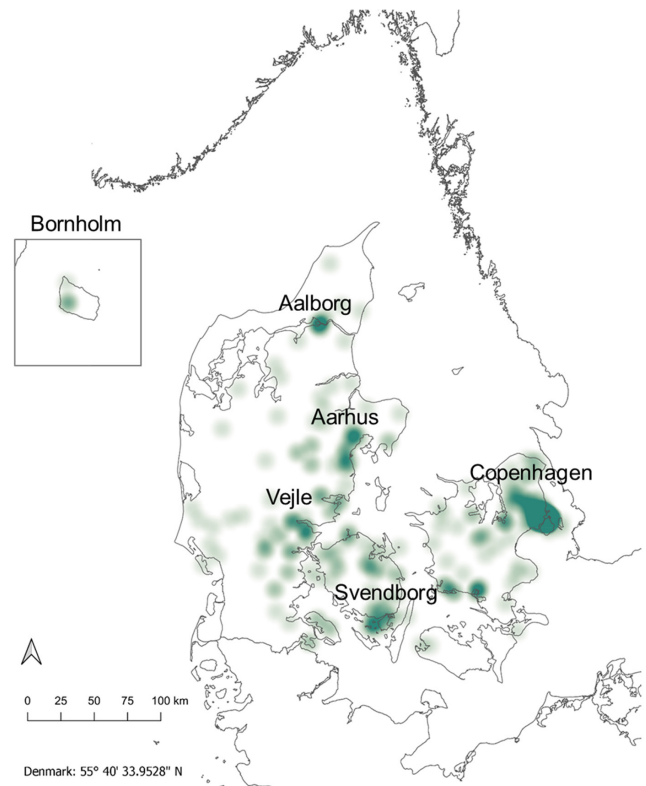


FIGURE 1 Heat map showing spatial distribution of responses to online questionnaire.

reported landscape preferences, lack of time, gardening habits and neighbourhood norms. The main categories we identified as 'others' were temporary tenancies, conflicting motivations and preferences among household members, and the need for recreational space for children.

Results from the multiple linear regression model showed that positive attitudes towards WFG, measured as adherence to WFG programmes, exhibited the highest positive covariance with the WFG index (Table 2). This suggested that respondents with positive attitudes towards WFG programmes were more likely to have gardens that were better for wildlife. Garden area was the second most prominent positive influence on the WFG index, echoing the negative covariance of self-reported lack of space with the WFG index. Accordingly, smaller gardens tended to offer fewer resources for wildlife. Interestingly, a lack of knowledge about the impacts of conventional gardening on wildlife covaried negatively with the WFG index. Retired people and those reporting a lack of economic resources were more inclined to have gardens with few WFG components. Last but not least, NEP positively covaried with the WFG index, revealing the importance of pro-environmental orientations for WFG engagement.

Results from the three multiple linear regression models (Table 3) showed that garden area and positive WFG attitudes (i.e. adherence to WFG programmes) exhibited the highest positive covariance with the completeness of levels of effort, meaning that those with larger gardens and positive attitudes towards WFG were more likely to invest more effort in attracting wildlife to their gardens. However, garden area gained in influence as the level of effort increased.

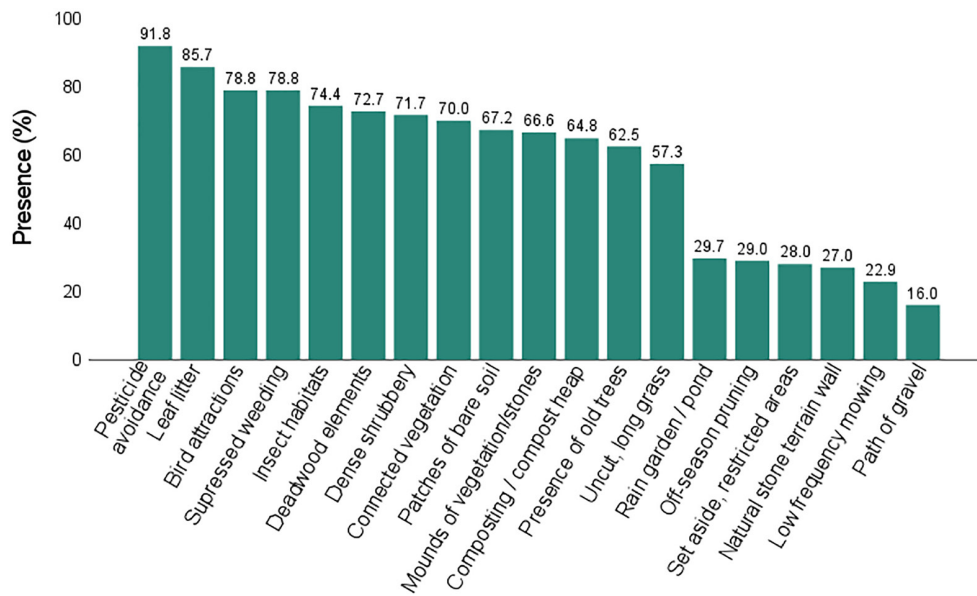


FIGURE 2 Presence of the 19 wildlife-friendly gardening components in the 293 surveyed gardens.

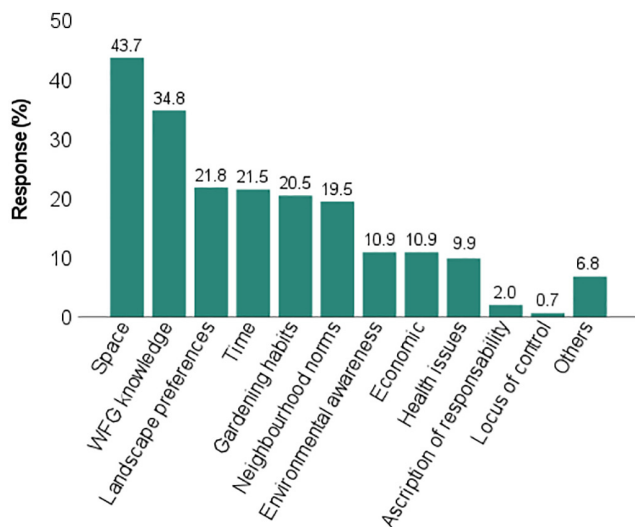


FIGURE 3 Frequency of self-reported barriers in online questionnaire ($N = 293$).

In other words, the more effort required to implement a specific WFG component, the bigger the garden had to be for that WFG component to be implemented. We also observed this effect with perceived lack of space, which covaried negatively with the WFG components requiring the greatest effort. Self-reported lack of economic resources and knowledge about the impacts of conventional gardening on wildlife covaried negatively with WFG components requiring medium and high levels of effort. Interestingly, neighbourhood norms covaried negatively with WFG components requiring the greatest effort. Additionally, the effect of NEP fell as the level of effort to implement WFG components increased, suggesting that pro-environmental orientations might be overridden by some of the abovementioned factors.

3.2 | Qualitative walking interviews

The walking interviews provided us with an in-depth understanding of how internal and external factors underlay WFG engagement, and they revealed the central role of gardening motivations and social relationships. Table 4 presents basic information on each case study garden; Table 5 represents the results of the thematic analysis of the seven walking interviews. Figure 4 shows pictures taken from each garden. The seven gardens selected as case studies differed from the survey population only in terms of gender representation (only one male gardener) and mean garden size (380 sqm, vs. 500 sqm in the survey).

The garden owners in cases 1 and 5 self-reported engagement with WFG programmes, and these gardens featured more WFG components than the others (Table 4). Although most reported motivations for having a garden were compatible with or even promoted WFG (e.g. Table 5, C5.1), family well-being and care, and personal well-being (via self-efficacy) (C7.1), conflicted with WFG in some cases. Garden owners possessed some knowledge either directly about WFG or about the negative impacts of conventional gardening practices on wildlife (C2.3–C5.4). This knowledge originated mainly from friends (C3.3) and family members (C6.1), although some interviewees had been instructed in more formal settings (C5.3). Interestingly, this WFG knowledge was not always applied in practice, as conflicting motivations for gardening and garden uses (C3.3) and other landscape preferences (C2.4) could override it. We identified two types of gardeners with two different landscape aesthetic preferences, which strongly related to different motivations: the manicured (C6.2, C2.4) and the laid-back gardener (C1.3, C3.4). In some cases, these preferences varied within households (C7.2) and even created conflict (C1.3). Furthermore, preferences regarding plant colour emerged as a species selection factor (C6.2). Family-related obligations could promote (C1.4) or hinder the allocation of

TABLE 2 Multiple linear regression with sociodemographic, internal and external factors as predictors for WFG behaviours (WFG index).

Predictors	Unstandardized B	Standard error	Standardized B	t	Sig.	95% confidence intervals	
Sociodemographic factors							
Age	0.018	0.095	0.012	0.185	0.853	-0.169	0.204
Gender (male)	1.052	2.195	0.024	0.479	0.632	-3.269	5.374
Job situation:							
Clerical	-5.140	2.582	-0.122	-1.991	0.048	-10.224	-0.057
Supervisor	-1.918	4.003	-0.026	-0.479	0.632	-9.801	5.966
Craftsperson	-9.704	4.063	-0.126	-2.389	0.018	-17.703	-1.704
Self-employed	-2.571	4.636	-0.030	-0.555	0.580	-11.699	6.557
Unemployed	-0.440	3.616	-0.007	-0.122	0.903	-7.560	6.681
Retired	-8.599	3.908	-0.147	-2.201	0.029	-16.295	-0.904
Student	-5.007	4.199	-0.072	-1.192	0.234	-13.276	3.262
Internal factors							
Motivations and attitude:							
Member of WFG programme	11.449	1.990	0.307	5.753	<0.001	7.530	15.368
Job related to nature	2.903	2.155	0.075	1.347	0.179	-1.341	7.147
NEP score	0.370	0.151	0.130	2.443	0.015	0.072	0.668
Knowledge:							
WFG knowledge	-0.987	2.248	-0.025	-0.439	0.661	-5.415	3.440
Impacts knowledge	-9.397	3.299	-0.159	-2.848	0.005	-15.894	-2.900
Other landscape preferences	-3.375	2.453	-0.071	-1.376	0.170	-8.204	1.455
Low locus of control	-1.876	11.963	-0.008	-0.157	0.876	-25.433	21.681
Ascription of responsibility	0.570	7.029	0.004	0.081	0.935	-13.270	14.411
Gardening habits	0.495	2.564	0.011	0.193	0.847	-4.554	5.544
External factors							
Physical space:							
Garden area	0.003	0.001	0.240	4.362	<0.001	0.002	0.004
Lack of space	-6.565	2.102	-0.175	-3.123	0.002	-10.704	-2.426
Garden type (private)	5.543	3.295	0.091	1.682	0.094	-0.946	12.032
Economic factors:							
High income	0.508	2.526	0.012	0.201	0.841	-4.466	5.482
Lack of money	-8.291	3.149	-0.140	-2.632	0.009	-14.492	-2.089
Lack of time to invest	1.377	2.425	0.030	0.568	0.571	-3.399	6.153
Social norms	-3.678	2.558	-0.078	-1.438	0.152	-8.716	1.359
Health reasons	4.661	3.370	0.073	1.383	0.168	-1.975	11.297
Other self-reported reasons	-4.661	2.411	-0.110	-1.933	0.054	-9.408	0.086

Abbreviation: WFG, wildlife-friendly gardening.

AdjRSquared = 0.329, N = 293. Statistically significant ($p < 0.05$) and nearly significant ($p < 0.1$) relationships highlighted in bold.

resources (i.e. time, money and effort) to WFG or gardening in general (C2.5). However, C1 demonstrated that the motivation to prioritize family well-being and outdoor recreation could go hand in hand with WFG (C1.3). Additionally, some gave hints regarding how WFG information should be presented to families with busy schedules

(C2.5). Some reported issues related to locus of control (C1.5, C6.3), questioning the importance of private gardens for biodiversity conservation compared with other land uses. Some participants also mentioned the importance of receiving noticeable positive feedback to maintain WFG behaviours over time (C2.6, C7.3). The role

TABLE 3 Multiple linear regression models for completeness of level of effort 1 'least effort' (model A; AdjR² = 0.174), level of effort 2 'medium effort' (model B; AdjR² = 0.239) and level of effort 3 'most effort' (model C; AdjR² = 0.294). All sociodemographic, internal and external factors were entered as predictors for the three models.

Predictors	Effort level 1 (A)			Effort level 2 (B)			Effort level 3 (C)				
	β	t	Sig.	β	t	Sig.	CI (95%)	β	t	Sig.	CI (95%)
Sociodemographic factors											
Age	-0.010	-0.137	0.891	0.010	0.144	0.886	(-0.003, 0.002)	0.027	0.391	0.696	(-0.002, 0.003)
Gender (male)	-0.014	-0.248	0.805	0.083	1.547	0.123	(-0.068, 0.053)	-0.026	-0.508	0.612	(-0.071, 0.042)
Job situation:											
Clerical	-0.022	-0.322	0.748	-0.105	-1.613	0.108	(-0.082, 0.059)	-0.158	-2.524	0.012	(-0.152, -0.019)
Supervisor	0.016	0.271	0.787	-0.034	-0.590	0.556	(-0.095, 0.125)	-0.037	-0.671	0.503	(-0.138, 0.068)
Craftsperson	-0.035	-0.592	0.555	-0.096	-1.705	0.089	(-0.145, 0.078)	-0.172	-3.164	0.002	(-0.273, -0.064)
Self-employed	0.056	0.948	0.344	-0.055	-0.955	0.340	(-0.066, 0.188)	-0.054	-0.973	0.331	(-0.179, 0.060)
Unemployed	0.055	0.875	0.383	-0.038	-0.632	0.528	(-0.055, 0.143)	-0.017	-0.287	0.774	(-0.107, 0.080)
Retired	-0.078	-1.056	0.292	-0.165	-2.318	0.021	(-0.165, 0.050)	-0.104	-1.516	0.131	(-0.178, 0.023)
Student	0.027	0.398	0.691	-0.120	-1.879	0.061	(-0.092, 0.138)	-0.056	-0.918	0.360	(-0.159, 0.058)
Internal factors											
Motivations and attitude:											
Member of WFG programme	0.269	4.536	<0.001	0.265	4.659	<0.001	(0.071, 0.180)	0.226	4.123	<0.001	(0.056, 0.159)
Job related to nature	-0.026	-0.413	0.680	0.094	1.581	0.115	(-0.072, 0.047)	0.096	1.663	0.097	(-0.009, 0.103)
NEP score	0.144	2.425	0.016	0.152	2.663	0.008	(0.001, 0.009)	0.025	0.454	0.650	(-0.003, 0.005)
Knowledge:											
WFG knowledge	-0.027	-0.420	0.675	0.011	0.180	0.857	(-0.075, 0.049)	-0.054	-0.920	0.359	(-0.085, 0.031)
Impacts knowledge	-0.061	-0.989	0.324	-0.170	-2.856	0.005	(-0.136, 0.045)	-0.140	-2.441	0.015	(-0.191, -0.020)
Other landscape preferences	-0.049	-0.862	0.389	-0.081	-1.471	0.142	(-0.097, 0.038)	-0.040	-0.757	0.450	(-0.088, 0.039)
Low locus of control	-0.083	-1.397	0.164	0.038	0.672	0.502	(-0.561, 0.095)	0.002	0.041	0.967	(-0.302, 0.315)
Ascription of responsibility	-0.006	-0.098	0.922	0.025	0.430	0.668	(-0.202, 0.183)	-0.014	-0.249	0.804	(-0.204, 0.158)
Gardening habits	0.029	0.472	0.637	-0.027	-0.461	0.646	(-0.053, 0.087)	0.036	0.641	0.522	(-0.045, 0.088)
External factors											
Physical space:											
Garden area	0.142	2.327	0.021	0.201	3.423	<0.001	(0.000, 0.000)	0.243	4.297	<0.001	(0.000, 0.000)
Lack of space	-0.131	-2.116	0.035	-0.083	-1.398	0.163	(-0.120, -0.004)	-0.224	-3.901	<0.001	(-0.162, -0.053)
Garden type (private)	0.064	1.063	0.289	0.081	1.406	0.161	(-0.042, 0.139)	0.078	1.405	0.161	(-0.024, 0.146)

(Continues)

TABLE 3 (Continued)

Predictors	Effort level 1 (A)			Effort level 2 (B)			Effort level 3 (C)					
	β	t	Sig.	CI (95%)	β	t	Sig.	CI (95%)	β	t	Sig.	CI (95%)
Economic factors:												
High income	0.060	0.923	0.357	(-0.037, 0.102)	-0.052	-0.826	0.410	(-0.086, 0.035)	0.042	0.699	0.485	(-0.042, 0.088)
Lack of money	-0.062	-1.043	0.298	(-0.132, 0.041)	-0.144	-2.534	0.012	(-0.172, -0.022)	-0.127	-2.321	0.021	(-0.177, -0.015)
Lack of time to invest	0.080	1.374	0.171	(-0.020, 0.113)	0.022	0.388	0.698	(-0.047, 0.070)	-0.018	-0.338	0.735	(-0.073, 0.052)
Social norms	-0.036	-0.601	0.549	(-0.092, 0.049)	-0.022	-0.385	0.701	(-0.073, 0.049)	-0.137	-2.467	0.014	(-0.149, -0.017)
Health reasons	0.138	2.346	0.020	(0.018, 0.203)	0.040	0.706	0.481	(-0.052, 0.110)	0.021	0.392	0.696	(-0.070, 0.104)
Other self-reported reasons	-0.126	-1.986	0.048	(-0.133, -0.001)	-0.078	-1.282	0.201	(-0.095, 0.020)	-0.077	-1.309	0.192	(-0.103, 0.021)

Abbreviations: NEP, new ecological paradigm; WFG, wildlife-friendly gardening.

Statistically significant ($p < 0.05$) and nearly significant ($p < 0.1$) relationships highlighted in bold.

of gardening habits, mostly related to childhood memories, also emerged during interviews (C4.1, C2.7).

Space and money were barely mentioned, whereas neighbourhood norms were prominently reported. Interviewees perceived these norms not only as official rules imposed by housing or allotment associations (C6.4), but also as social norms regarding other people's expectations about the appearance of their gardens (C4.5, C6.5). Both types of norm played against some WFG principles. Household system (e.g. number of people with a right and/or access to the garden, and property ownership) emerged as important for gardening behaviours. In complex multi-occupied households, multiple opinions about the use and design of the garden had to be accommodated, potentially hindering or promoting WFG (C7.4–5, C4.7, C5.5). Furthermore, rental tenants, who were temporary residents, were more hesitant to allocate resources to garden maintenance (C4.6, C3.8). Last but not least, in more conventional household settings, males tended to dominate females in some key gardening decisions, especially regarding the appearance of lawns (C3.3, C1.3, C7.1, C7.2).

4 | DISCUSSION

4.1 | Gardening motivations play a central role in engagement in WFG

Our results demonstrated that garden owners who engaged with WFG programmes and followed their recommendations were more likely to have gardens with a wider range of wildlife-friendly components, generating key habitats for wildlife. This reflected how positive attitudes towards biodiversity conservation could ultimately relate to gardens and their biophysical characteristics to support wildlife.

Motivations are reasons or internal stimuli around which behaviour is organized (Wilkie, 1986). Clayton (2007) identifies two main sets of motivations for gardening: (1) appreciation of nature and (2) social concerns. Our findings suggested that the desires to lead an organic lifestyle (e.g. through permaculture) and appreciate and learn about nature were motivations relating to engagement in WFG. Conversely, we observed that motivations related to family well-being and care (e.g. children's play, family gatherings) and personal well-being (e.g. conformity to social norms) could work against certain WFG principles, as also found elsewhere (Home et al., 2019). This supports previous research findings: motivations related to the appreciation of nature are more likely to support WFG practices (Clark et al., 2019; Goddard et al., 2013); motivations arising from social concerns, such social norm conformity or self-efficacy, might hinder WFG practices (Clayton, 2007). However, case study 1 exemplified how family well-being (i.e. children's outdoor recreation), which impeded some WFG components in other gardens, could be compatible with WFG. This garden was the wildest of the seven case studies; its gardener said that 'the kids love to move around here', and they were sure 'they were getting more interested in nature',

TABLE 4 Basic information on each case study garden.

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
Gender	Male	Female	Female	Female	Female	Female	Female
Age	48	40	30	27	42	39	76
Participation in WFG programme	Yes	No	No	No	Yes	No	No
WFG index	14	7	5	11	12	8	11
Garden area (sqm)	600	380	30	150	300	500	600
Housing type	Owned, single family	Owned, single family	Rental	Multi-occupied (rental)	Multi-occupied	Owned, allotment	Owned, multiple families

Abbreviation: WFG, wildlife-friendly gardening.

acknowledging some of the multiple benefits for children of wilder, higher-quality urban green (Miller, 2005; Soga & Gaston, 2016). Case study 1 suggests a potential transformative pathway whereby barriers related to social concerns (e.g. family well-being) can be leveraged to foster WFG practices for biodiversity conservation.

We believe the reason why only a few internal and external factors predicted WFG engagement, and those only weakly, was precisely the modulating role of gardening motivations. As Kollmuss and Agyeman (2002) show, internal and external factors that impede pro-environmental behaviours usually emerge from motivations that conflict with pro-environmental action. This places motivation at the core of pro-environmental behaviours (Steg et al., 2014), which is why it is central to our discussion. During the walking interviews, we observed that nonenvironmental motivations operated via priorities and landscape preferences, and dictated the allocation of resources such as money, space, time and effort. However, our results showed that while motivations were central, they alone did not explain WFG engagement. Factors that influenced WFG engagement also included perceived lack of space and garden area, lack of knowledge, pro-environmental orientations and social norms. In what follows, we describe how these factors were contextualized in gardens, how they were modulated by motivations for having and maintaining a garden and how this might help to explain engagement in WFG.

4.2 | Internal and external factors underlie motivations

Our study supports previous findings showing a negative correlation between garden area and habitat composition and heterogeneity to support wildlife (Gaston et al., 2007; Smith et al., 2005). This implies the overall lower potential of smaller gardens to contribute to urban biodiversity conservation (Goddard et al., 2013; van Heezik et al., 2013). However, we argue that lack of space for WFG components is exacerbated by conflicting gardening motivations, which determine the use of available space in garden design and maintenance. According to our results, WFG components (e.g. long grass meadows, and ponds or rain gardens) were less common when they directly competed for space with other garden uses. Furthermore,

WFG components requiring greater effort, space, and investments of time and money were more likely to be affected by garden area. This was likely because small gardens had less space to accommodate all the desires and uses within a household, making it more difficult for WFG components to occur.

Lack of knowledge about the impacts of gardening on wildlife, or how to readdress problematic practices, was widely reported in the survey and covaried negatively with WFG engagement. This confirms recent research that also finds lack of knowledge to be an important barrier to WFG engagement (van Heezik et al., 2020). Appropriate communication with stakeholders is one of the ways public and nonprofit institutions can influence individual decision-making in the private sphere (Dewaelheyns et al., 2016). However, in our view, there are two key aspects of knowledge to consider.

First, as Goddard et al. (2013) state, to learn about WFG, people must want to 'get to know' more about WFG in the first place. If garden owners have no interest in wildlife conservation, or even in gardening, they will likely not invest effort in learning how to improve their gardens for wildlife. Unfortunately, gardening for wildlife is oftentimes not a priority or motivation (Beumer & Martens, 2015; Chalmin-Pui et al., 2021); instead, garden management style is guided by aesthetics and ease. Thus, catching the attention of the unengaged gardener remains a challenge (Shaw & Miller, 2016). As one interviewee suggested, for garden owners who lack time due to their other preoccupations and duties, information about WFG should be presented simply and straightforwardly, and should be readily available. Hence, decisions regarding the content and dissemination of WFG information must take account of the diversity of garden uses and preferences, and of people's differing inclinations to invest time, effort and money in gardening activities (Ballantyne & Hughes, 2006; Pelletier & Sharp, 2008; van Heezik et al., 2012). As Steg et al. (2014) propose, this is an example of how gain goals (i.e. low investments of time and money) can be made compatible with normative goals (i.e. making gardens more wildlife-friendly).

Second, knowledge about the negative impacts of conventional gardening (e.g. pesticides' toxicity to fauna) and potential alternatives (e.g. companion plants) does not guarantee behavioural change. As our interviews showed, people accepted and even engaged in behaviours that might contradict some of their personal beliefs and WFG knowledge (e.g. throwing away garden waste despite being

TABLE 5 Examples of statements from case study garden interviews, organized by internal and external behavioural factors.

Behavioural factors	Walking interview statements	Ref.
(a) Internal factors		
Gardening motivations		
Organic lifestyle	'I use the garden for my permaculture interests. [To control] the snails, we do not use pesticides; instead, we use beer traps'.	C5.1
	'I would like to have more edible plants in the garden, [...] plant some berries or something. I like the idea of a garden where you can taste everything'.	C3.1
Family care and well-being, nature appreciation, and outdoor learning	'The lawn makes the garden more accessible. We use it as a recreational space for our family'.	C2.1
	'It feels more like being in the woods and not in a garden with plain grass [...]. I like to go around [the garden] and take pictures and try to identify [the insect species]'.	C1.1
	'The kids love to move around here [...]. I am sure they are getting more interested in nature. [...] It's also important for [my son] to tell his friends that bumblebees are not dangerous and that [biodiversity is] something to take care of'.	C1.2
Personal well-being (self-efficacy) and aesthetics	'I like the fact that plants appear and I get to know them'.	C3.2
	'The main use of the garden is coming here and tending it. [My husband] likes having jobs and projects to do in the garden, and loves mowing the grass. He does it once a week'.	C7.1
Knowledge		
WFG and impacts of conventional gardening	'[My husband] read somewhere that if you wait until [the bushes] are done with the flowers then it's better for the insects'.	C2.2
	'I like not to [prune] the trees so much. [Birds] are happier if they have small places where they can hide. [...] I told my daughter that she has to have water for the birds'.	C6.1
	'[A pond] is good for the wildlife'.	C5.2
	'I took a permaculture course. [...] This [plant] is a perennial that is mostly for nitrogen-fixing. I cut it [every] year and put it on top of the [vegetable] beds'.	C5.3
	'We would never use pesticides in our garden'.	C2.3
	'This is seaweed that I will put around the squash. The snails do not like [it]'.	C5.4
	'My friend [the previous owner] made this clover lawn [for the] bees. So we are trying to figure out when to mow it so as not to disturb the bees. But my boyfriend really likes to cut the grass, so we should probably have a talk about not doing it so often'.	C3.3
Landscape preferences	'Sometimes I would like to have an area of the grass with some meadow flowers, but [my husband] does not like it. This is why we have the flower beds'.	C7.2
	'Natives have smaller flowers, and this is why [my daughter] does not buy natives'.	C6.2
	'In my mind [biodiversity and aesthetics] combine, so when it is working for biodiversity it looks good to me. [...] But my main concern here is actually my wife; she is like, why do not you mow the lawn? [...] But I have a free hand, almost a free hand [to do whatever I want]'.	C1.3
	'I have to admit we have been taking garden waste [deadwood] away, because it looks messy. But I guess you could hide it somewhere'.	C2.4
	'I also like [the garden] to be colourful, but I think that goes hand in hand with not having such a monoculture but having a lot of different stuff'.	C3.4
Responsibilities and priorities	'It's giving me a good sense of well-being, maybe it's keeping me and my kids healthier, [and] I'm sure my kids are getting more interested in nature'.	C1.4
	'Easy garden changes and checklists of what to include and avoid would be more realistic [to engage] families with children and complicated work situations'.	C2.5
	'[The flowerbeds] are still overgrown; [...] we do not want to take the time'.	C3.5
Locus of control, lack of positive feedback and habits		
Locus of control	'I do not think that [WFG] is saving biodiversity. We need larger natural areas, even wilder'.	C1.5
	'I do not think there are more birds out there because of the way we [manage] this garden. I think it is more the wilderness, like the neighbouring [neglected, wild] plot'.	C6.3
Lack of positive feedback	'I do not know if I would be able to notice if it had worked out or not'.	C2.6
	'Last year I got a mix of seeds to attract insects that I planted. But it did not work very well, I think I did something wrong'.	C7.3
Habits	'[In this house] we have all grown up with you cut all the grass, you do not just leave it'.	C4.1
	'In my garden as a kid, nobody had time to tend it'.	C2.7

TABLE 5 (Continued)

Behavioural factors	Walking interview statements	Ref.
(b) External factors		
Space	'As the garden is so small and there is already so much in it'.	C3.6
	'It is not like anyone will disagree, [unless it] takes up a lot of space'.	C4.2
Economic factors	'I do not want to spend too much money, [...] and I also like it to be easy and not too time-consuming'.	C2.8
	'Easy and not too time-consuming [tasks]. Also it cannot be too expensive, because there are six of us using the place, and it is different how much effort people want to put into the garden'.	C4.3
Neighbourhood norms	'Now it's a trend, having deadwood in the garden, but if you would do it in an allotment garden it would change the look of the garden, and I do not think the allotment garden association would [accept] it'.	C6.4
	'You can see that the neighbours keep the garden very neat'.	C3.7
	'Our homeowner association has a beautification committee that decides what's pretty, and also that everything stays in the right [historical] look'.	C4.4
	'Even though we like the [wild] look, we are also thinking about how the rest of the street, and the housing association we are members of, are going to like our garden if it is too crazy or all over the place. Although I do not think that we want to admit it'.	C4.5
Household system	'I had to cut the ivy down. It had to look okay for the neighbours. But I liked it'.	C6.5
	'We do things in the garden with the hope of it being permanent. But we never know'.	C4.6
	'Sometimes we agree, but other times it is more difficult to agree on a project'.	C4.7
	'Right now we are renting this place, but we are talking about [buying] it. If we do, I would like to replace the shed with a greenhouse'.	C3.8
	'This [bird box] is mostly due to our son-in-law, [who lives upstairs and] likes birds and also hedgehogs'.	C7.4
	'Our daughter [who lives upstairs] is a biologist and does not like the grass. So we discussed the design of the garden with her and her husband'.	C7.5
	'There is no main use of the garden. Some use it for leisure, I use it for food production, others for just playing and being here by the bonfire, the workout place, for partying, etc. But I like it, otherwise I would not be able to live in a place like this'.	C5.5

Abbreviation: WFG, wildlife-friendly gardening.

aware of potential wildlife-friendly solutions). As Yankelovich (1991) asserts, this is likely because we tend to compartmentalize our thinking to make daily decision-making less uncomfortable, blurring the link between WFG knowledge and behavioural response (Kollmuss & Agyeman, 2002). Yet, we argue that the social context of these decisions, including the relationships between other family members and the broader community, might help explain this apparent cognitive dissonance. Our interviews corroborated that people's social context is an important source of know-how (Diduck et al., 2019), but at the same time also a source of conflicting gardening motivations and priorities that can potentially impact attitudes and behaviours. Later, we will elaborate on the potential role of these social structures in promoting or impeding WFG behaviours.

4.3 | The role of values, preferences and resources

Pro-environmental orientations and worldviews, which we measured through the NEP scale (Dunlap et al., 2000), covaried positively with WFG engagement. This supports van Heezik and others' (2013) finding of a relationship between NEP score and vegetation structural complexity in gardens in New Zealand. Nonetheless, we also found that these pro-environmental orientations were often overridden by other factors. Consequently,

we support the findings of Shaw et al. (2013), who suggest that a strong sense of connection to nature, and consequently a pro-environmental orientation, may promote engagement in WFG but is not a prerequisite for it.

In our regression results, landscape preference did not covary with WFG engagement, despite being the third most popular self-reported barrier. However, our case study interviewees made frequent references to the landscape implications of WFG as a motivation. We identified plant trait preferences such as colour to be determining factors in plant selection, which is corroborated by previous studies (Kendal et al., 2012). Additionally, we identified two types of gardeners with two different aesthetic preferences: the manicured and the laid-back gardener. The manicured gardener embodied Nassauer's (1995) classic division between ecological quality and visual preference (Gobster et al., 2007). In this case, the preference was for open and coherent landscapes, which chimed with prospect-refuge (Appleton, 1996) and information-processing theories (Kaplan et al., 1998). On the other hand, laid-back gardeners found beauty in vegetation they perceived to be naturally occurring, and they not only accepted more structurally complex landscapes but actually preferred them. These findings support those of Lindemann-Matthies and Marty (2013) and Hoyle et al. (2017), suggesting that ecologically managed, species-rich landscapes are slowly gaining social acceptance.

Although lack of economic resources was not a common self-reported barrier among our participants, our regression results showed a weak but clear correlation between self-reported lack of money and WFG index, suggesting that a perceived lack of economic resources could impede engagement in WFG. Our results also suggested that a lack of economic resources could hinder the implementation of WFG components that required greater commitment and effort. Our interviews revealed that people in certain situations, such as young families and multi-occupied houses, tended to keep economic factors at the forefront of their gardening decisions. However, we could not find any universal relationship between income and WFG engagement. This echoes the inconclusive, at times even contradictory literature on economic factors and gardening behaviours (Gaston et al., 2007; Lepczyk et al., 2012).

4.4 | The diverging role of social norms

Social norms were not widely reported as barriers in our survey and showed no pronounced covariance with engagement in WFG. Nonetheless, they seemed to impede WFG components that required greater effort. Additionally, neighbours' expectations and more formal rules (e.g. housing and allotment association regulations) were recurrent themes during the walking interviews. The mismatch between our survey and interview results might simply be due to a misunderstanding of the vague term 'neighbourhood norms' in the survey—which perhaps suggested only formal rules—or to respondents' unwillingness to accept social pressure (Clayton, 2007; Keizer & Schultz, 2018). Alternatively, it might be that because social norms operated beneath their own motivations and landscape preferences, people found it difficult to acknowledge the relationship between them. In any case, most participants were willing to fit in and maintain good relations with their neighbours, either by copying gardening styles from their surroundings or by obeying formal norms and rules (Nassauer, 1995; Nassauer et al., 2009; Zmyslony & Gagnon, 2000). Although this 'neighbour mimicry' generally works against most WFG principles (Nassauer et al., 2009; van Heezik et al., 2020), it may also provide a good opportunity to promote WFG practices if the direction of the 'contagion effect' is reversed and harnessed (Goddard et al., 2013; Warren et al., 2008). For example, public attitudes towards the use of pesticides for lawn maintenance have shifted, fostering the adoption of organic alternatives, a phenomenon confirmed by our results and other recent studies (van Heezik et al., 2020). This transition has even been publicized through certification schemes such as the 'poison-free garden' (Giffri have, 2021). This is an example of how, through neighbour mimicry and spatial contagion, social norms can become mechanisms to advance WFG (Goddard et al., 2013). Consequently, we maintain that social norms are considered by garden owners and are a dominant factor in private domestic garden design and maintenance (Li & Nassauer, 2020; Nassauer et al., 2009; Raymond et al., 2019). This points to the importance of considering gardening as a relational practice.

4.5 | Gardening as a relational practice

Bhatti (2014, p. 4) writes, 'The domestic garden and gardening is embedded in social relations, which often comes out in the way people talk about their gardens; it is usually in relation to family members, neighbors, and the wider community'. Private gardens are part of an interconnected socio-ecological system, nested in social structures that affect their biophysical state. Our investigation of people's motivations for engaging in WFG revealed that gardening practices were often deeply rooted in relational values between people and nature. Contrary to instrumental and intrinsic valuation processes, relational values focus on the preferences, principles and virtues associated with relationships (Chan et al., 2016). Family well-being and care, social cohesion, and respect and care for nature are examples of gardening motivations that emerge from relational valuation processes, in which relationships are more important than outcomes (Himes & Muraca, 2018). Our study revealed that the effects of internal and external factors on the expression of gardening behaviours were often mediated by relational motivations.

Holding a relational value orientation towards nature usually entails care and respect for the environment and is a recognized mechanisms supporting nature conservation (Mattijssen et al., 2020). In our study, this was evident in the case of the permaculture garden, where gardening organically and with respect for nature was a primary motivation that led to WFG outcomes. However, we found that the role of relational values in promoting WFG could be ambivalent. Relational values also guide relationships between people concerning and mediated by the environment (Chan et al., 2016). During walking interviews, we observed that maintaining good relations with household members, friends or the broader community were important gardening motivations (Chan et al., 2016), as also found elsewhere (Clayton, 2007). Whether or not such relationships promote WFG depends on with whom we want to maintain good relations and the social norms embedded in the relationship. For example, copying manicured gardening styles to fit into the neighbourhood—social cohesion—enacts social norms that arise from the nature–culture disconnect in Western societies and the instrumental use of nature for human exploitation (Power, 2005). On the other hand, feeling inspired and approved of by family members and friends who take a more protective and relational view of nature (i.e. care and respect for nature) is an example of how relationships can potentially promote the spread of WFG practices. Our walking interviews revealed how people's preferences for WFG leaked into the gardening decisions of others via diffusion behaviours (Jones & Niemiec, 2020), prompting the expression of some WFG behaviours even in spite of personal gardening preferences. Consequently, we maintain that these social structures can be successful transformative pathways for introducing WFG principles that leading gardeners might not otherwise consider.

Power divisions and asymmetries, and unequal individual agency between household members with regard to garden maintenance, emerged during the walking interviews and seemed to matter when it comes to gardening practices. A variety of opinions and garden

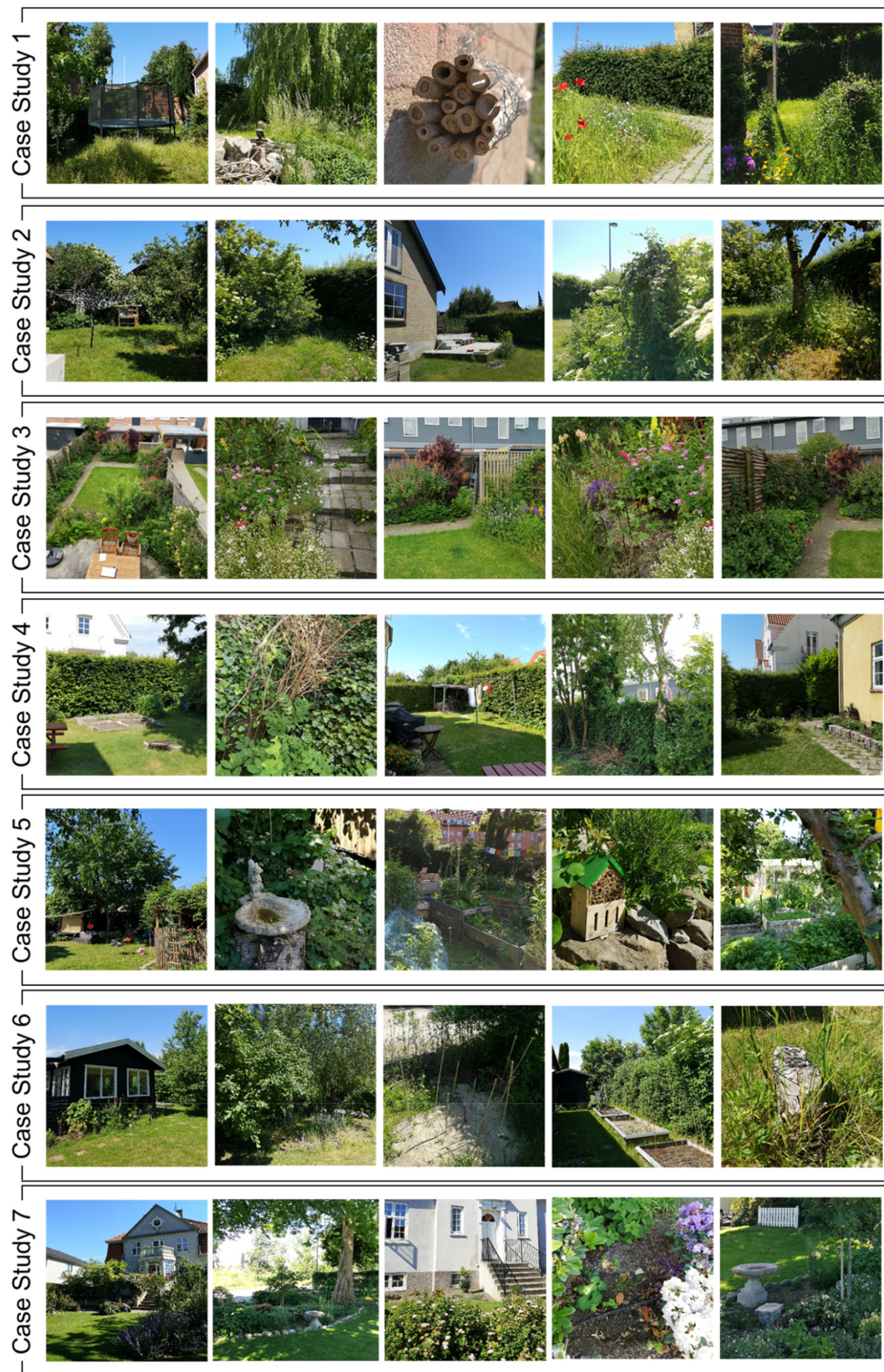


FIGURE 4 Photos of the seven case study gardens.

motivations within the same household might shape WFG, even in multi-occupied housing units where all tenants have equal decision-making rights. Finding a consensual balance between multiple desires among household members is another example of how collective relational values—the wish to maintain social cohesion and nurture good group relationships (Chan et al., 2016)—shape behaviours.

4.6 | Limitations and future studies

The extreme case selection approach for the walking interviews in stage 2 helped us to capture a wide range of opinions regarding WFG, different levels of engagement and diverse gardening motivations. However, our results are based on a sample of garden owners who had some

interest in WFG or wildlife. We therefore acknowledge the need for replicating studies to generalize our results to the broader population. Additionally, this study is based on self-reported measures of behaviours, trusting in participants' capacity to accurately describe the reality of their gardens. Moreover, the WFG index gives each component the same weight, and overlooks potential issues regarding the attraction of invasive alien species. This is due to the small body of empirical evidence demonstrating the effect of specific WFG practices on wildlife conservation. We therefore suggest that future studies (1) triangulate these self-reported behavioural data with observational measures of gardening behaviours and (2) complement indicator-based biodiversity assessments with direct observations of native and non-native taxa.

This study demonstrates that in order to understand how WFG behaviours are articulated, we must broaden the self-oriented, independent approaches found in environmental psychology scholarship and bring relational dimensions into the analysis (Eyster et al., 2022). Having explored the importance of the social structures (i.e. housemates, friends, family, neighbours) in which private gardens are embedded, we highlight the role of relational values in mediating motivations for gardening and ultimately for engagement in WFG. Therefore, we encourage future studies to adopt more relational approaches that better include the feedback between individual actions and social relations. Finally, but importantly, we highlight the power of mixed methods to generate qualitative and quantitative insights, and we invite future research on complex human–nature relationships to continue to use such approaches.

5 | CONCLUSIONS

Private domestic gardens are highly heterogeneous in size and style (van Heezik et al., 2020), and their potential to contribute to urban biodiversity conservation relies primarily on the individual gardening behaviours of each garden owner, referred to as the 'tyranny of small decisions' (Dewaelheyns et al., 2016). WFG is a pro-environmental behaviour that aims to readdress garden design and maintenance to attract wildlife and contribute to biodiversity conservation. Our study explored the most important factors explaining engagement in WFG and examined the effect of gardening motivations and social structures on that engagement.

We explored how organic gardening, nature appreciation and willingness to learn from nature could promote engagement in WFG, while personal and family well-being and care could conflict with it. We also demonstrated that gardening motivations alone could not explain engagement in WFG: other factors also covaried with WFG behaviours, such as garden area, stakeholder knowledge about WFG, personal pro-environmental orientations and social norms. We stressed that relationships with people and nature, enacted by social norms of community acceptance, cohesion, and care and respect for nature and others, interfered with engagement in WFG practices. Despite the limitations of our study, we hope our reflections on how behavioural and relational factors explain engagement in WFG can help to guide future steps to foster community engagement in WFG.

AUTHOR CONTRIBUTIONS

The precise contributions of each author were as follows: Oriol García-Antúnez: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Data curation, Writing—original draft, Writing—review & editing, Visualization. Jens Lindgaard: Conceptualization, Methodology, Validation, Investigation, Resources, Data curation, Writing—review & editing. Jussi Lampinen: Conceptualization, Validation, Resources, Formal analysis, Writing—review & editing, Supervision. Anton Stahl Olafsson: Conceptualization, Methodology, Validation, Resources, Writing—review & editing, Supervision, Project administration, Funding acquisition.

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CONFLICT OF INTEREST STATEMENT

No potential conflict of interest was reported by the author(s).

DATA AVAILABILITY STATEMENT

The anonymous data from the questionnaire are publicly archived on Zenodo, accessible at <https://doi.org/10.5281/zenodo.5549479>. Interview data from the case studies are not available due to data privacy agreements made with participants.

ORCID

Oriol García-Antúnez  <https://orcid.org/0000-0001-7814-1629>

Jussi Lampinen  <https://orcid.org/0000-0002-5938-7428>

Anton Stahl Olafsson  <https://orcid.org/0000-0002-7940-8126>

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Supporting information S1. Overview of the selected WFG components, organized into WFG features and WFG practices, with references to existing literature on their relation to wildlife or ecosystem health.

Supporting information S2. Full survey.

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