# Participation in local food projects is associated with better psychological well-being: Evidence from the East of England.

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**ABSTRACT**

**Background:** Studies suggest that local food may contribute to well-being, but do not use standardised measures, or control groups.

**Methods:** An online survey compared participants of local food initiatives (n=302) with members of the general population (n=157) in terms of scores on standardised measures of well-being and distress. Using hierarchical ordinary least squares regression models, we explored the relationship between participation and well-being via four mediators – nature connectedness, psychological need satisfaction, diet and physical activity.

**Results:** Participants scored higher than non-participants on life satisfaction ($t(346) = 2.30$, $p = .02$, $\rho r = .12$) and the WEMWBS scale ($t(335) = 2.12$, $p = .04$, $\rho r = .10$), but differences in psychological distress were insignificant. More actively engaged participants scored higher on positive well-being and longer duration participation was associated with higher life satisfaction and less psychological distress. Finally, we found that participation contributes to psychological need satisfaction, better diet and connection to nature, three known drivers of well-being.

**Conclusions:** Well-being may be a co-benefit of local food initiatives beyond the physical and psychological benefits of growing food. Further research is needed to explore the mediators driving these effects, quantify benefits, and track impacts over time and across different social groups.

**KEYWORDS**

Communities, Food and nutrition, Mental health

## INTRODUCTION

The contribution of alternative modes of food production, provisioning and consumption to physical health[1, 2, 3, 4] diets[5, 6] and social goods[7, 8] has been highlighted, but in the sphere of potential contributions to mental health, there is a lack of generalisable evidence [9].

This gap is worth addressing, because psychological well-being generates benefits for individuals and societies, including good health, longevity, improved relationships, better productivity and civic citizenship[10, 11]. Additionally, mental illness presents a growing global public health crisis [12], with an estimated burden of 32.4% of years lived with disability and 13% of disability-adjusted life-years[13]. In the UK, mental ill-health contributes to 28% of the total disease burden[14]. Fostering well-being may confer a protective effect against the later onset of ill-health[15]. Relevant drivers include diet[16, 17, 18, 19], physical activity[20, 21], connection to nature[22], social connection[23] and the opportunity to fulfil basic psychological needs for autonomy, competence and relatedness[24]. Several of these drivers are potentially manifest in local food initiatives, as we outline subsequently.

Definitions of 'local' food vary[25] from 30 miles[26], to 400 miles[27] between farm and fork. Our paper focuses on seven different types of local food initiative (Table 1), reflecting the diversity of the movement.

**Table 1: A brief outline of seven different types of local food initiative in the UK and their scale in terms of number of initiative or number of consumers involved.**

| INITIATIVE | DESCRIPTION | SCALE |
|---|---|---|
| **Supermarket ranges of specialist 'local' food** | Consumers purchase locally-sourced food in a conventional retail environment. Consumer participation is limited to selecting items chosen by suppliers who curate ranges, manage stocks and set prices. | Local and regional food represents ≈6% of food and drink sales (Defra 2003). Between 2010 and 2011, local ranges in one supermarket chain alone increased by £130 million (Rohwedder 2011). |
| **Community shops** | Community-run retail outlets selling locally-sourced produce, with community members and business-owners typically interacting more frequently than is the norm in mainstream retail environments. | ~337 community shops (Plunkett Foundation 2016). |
| **Box schemes** | Consumers are sent locally-produced food, usually weekly. Participants may exercise limited choice over the content of their boxes. Scheme sizes vary greatly, from 50,000+ customers to schemes with a few dozen participants. | Over 500 schemes (ethicalconsumer.org 2016). |
| **Farmers' markets** | Farmers sell locally-grown produce within farmers' markets. | ~ 500 markets; 250 are FARMA-certified, guaranteeing the provision of ethically- or locally-produced food (DEFRA 2013) |
| **Buying cooperatives** | Groups self-organise to bulk-buy produce, choosing what to purchase, where to source goods and enjoying lower prices due to bulk purchases. | There are 6,796 cooperative businesses in the UK, owned by around 15 million people. 416 are retail cooperatives, and 621 are agricultural (Cooperatives UK) |
| **Allotments** | Individuals cultivate food on allotment plots, exercising sole discretion over their choices in line with allotment regulations, and are solely responsible for food production. | ~330,000 plots; 90,000 more are needed to meet demand (National Allotment Society, 2016) |
| **Community food growing** | Collectively-run production in community-managed gardens. Small groups participate in joint decisions about what to grow, and collaborate to grow and distribute food. | ~1000 community gardens (Federation of City Farms & Community Gardens, 2016). |

Consumer interest in local food is growing. Two-thirds of consumers in the US and 80% in the UK express an interest in buying local produce[28, 29]. Over half of US consumers seek information on the provenance of their food[30] and retail sales for local ranges have grown by 13% annually since 2008[31]. In the UK, some 6 million are interested in having an allotment[32]. The number of farmers' markets has grown over 20-fold, from 340 in 1970 to 8,000 in 2012[33] and in the US, the number of community-supported agriculture schemes has grown from 2 projects in the 1980s to over 3,500 in 2009[34].

Growing food offers an opportunity for green exercise, which enhances both physical and mental well-being[35]. Allotment gardeners report higher levels of physical activity, scoring better than non-gardeners on all measures of health and well-being [36], including better mood, self-esteem, general health and vigour, and less mood disturbance, depression and fatigue [37].

All forms of local food initiatives engage people with the physical context of food growing either directly or indirectly through a discourse of more sustainable production and a re-connection to the natural elements of its production[38]. Nature connectedness is positively associated with vitality, subjective well-being and happiness[22, 39; 40; 41; 42; 43; 44; 45], reduced physiological markers of stress[46] and lower mental distress[47]. Diet – and particularly the consumption of fresh fruit and vegetables – is important for mental well-being[19; 48] and engagement with food initiatives has also been shown to improve diets[6; 49;].

Finally, well-being is associated with the satisfaction of three basic psychological needs – for *autonomy*, or an experience of choice and volition in one's actions; *competence*, or the feeling one is efficacious and can achieve desired outcomes in the world, and *relatedness*, or the experience of closeness and connected with others[24, 50]. Need satisfaction is associated with greater happiness and life satisfaction and lower symptoms of depression and anxiety[51, 52, 53, 54]. Local food projects may offer opportunities to satisfy all three needs, by increasing ecological literacy and improving food preparation skills (autonomy and competence), providing a sense of belonging and shared goals (relatedness) and giving people the ability to participate directly in a social enterprise (competence and relatedness).

These benefits are implicitly recognised by practitioners[55] but there is as yet no generalisable evidence on the links between participation in local food initiatives and mental health, with the exception of studies on food-growing that focus primarily on its contribution to green exercise[4]. Existing studies have not used standardised measures of psychological well-being or distress, nor focused on the general (rather than the therapeutic) population[56]. Initiatives that do not involve a food-growing component are largely unexamined.

To fill these gaps, we explored whether participation in a range of local food projects would be associated with higher well-being relative to a control group of non-participants, among a sample from the general population, and we examine, for the first time, the mechanisms that may underlie any association.

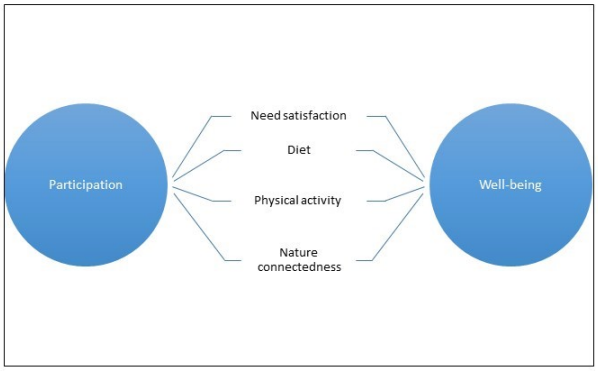
We hypothesise:

(1) Participants in local food projects would score *higher* on well-being and *lower* on measures of psychological distress than non-participants;

(2) Increased participation would be associated with increased well-being and lower levels of distress.

(3) Four mediators would indirectly influence the association between food project engagement and well-being – connection to nature, the satisfaction of basic psychological needs, diet and outdoor physical activity (Figure 1).

**Figure 1: Model showing hypothesised links between participation in local food projects and well-being mediators of psychological need satisfaction, nature connectedness and outdoor physical activity.**




## METHODS

A questionnaire was deployed using Qualtrics (qualtrics.com), an online tool for collecting, storing and analysing survey data. Online surveying was used in order to generate a large sample across three English counties – Essex, Norfolk and Suffolk – within the context of a time-bound research project.

### *Participants*

Survey respondents were recruited via a mix of snowballing from known contacts and convenience sampling, using the following methods:

(1) We targeted local food participants by emailing the survey link to gatekeepers in local food projects. Recipients were asked to send the survey link to participants in their initiatives, onward through their wider networks, as well as to contacts who could give their views as non-participants. In cases where emails were unanswered and a contact number was available, we followed up with a phone call.

(2) We wrote a short post about the research on our project website, with a link to the survey, and advertised this using the project Facebook page and Twitter account, as well as the personal social media accounts of the researchers involved. These posts (website and social media) asked for people to share the link to the survey and highlighted that we were searching for both participants in local food projects as well as non-participants drawn from the general public.

(3) Finally, we wrote a short press release summarising the project and calling for survey respondents. This was picked up by the online edition of a local newspaper, which helped to spread word within the study area.

The survey was not password-protected, allowing respondents to share it onward as widely as possible. No incentives were offered to participants for completing the survey.

*Variables*

The same survey instrument was used for both participants and non-participants, with some questions in common and others pertaining to the details of participation (these were restricted to respondents who had self-identified as such). Questions were put to all respondents in the same order, and are summarised in Table 2.

**Table 2: Variables included in a survey comparing well-being scores of participants and non-participants in local food projects in the East of England and testing for potential mediators of any differences found.**

| Variable | Survey component | Reason for inclusion |
|---|---|---|
| **Demographics**<br><br>**(All respondents)** | • Location (County and name of town/city/village)<br>• Date of birth<br>• Gender<br>• Employment status (as a nominal variable, including the following options: Full-time work, part-time work, student, house-person, retired, other)<br>• Yearly earnings (as a categorical variable, with the categories: <£10,000, £10-20,000, £20-30,000, £30-40,000, £40-50,000 and >£50,000) | Location data was collected in order to clarify, in further analyses, the influence of residence in different sized towns and compare across our 3 case counties.<br><br>Age (collected as date of birth), gender and income (collected as yearly earnings) are important mediators of well-being, to control for in our analysis.<br><br>Employment status was collected in order to clarify, in later analyses, the influence of time-availability on participation in different types of food projects. |
| **Well-being measures**<br><br>**(All respondents)** | • *The Warwick-Edinburgh Mental Well-being Scale*[*] (WEMWBS)<br>• *Life Satisfaction* (standardised 11-point single measure)<br>• *The Duke Anxiety-Depression Scale* ('DUKE-AD') | *WEMWBS* includes hedonic elements (capturing positive affect) and eudaimonic elements (a sense of purpose). It has been validated for use in the UK among adults aged 16 and over,[57] with a provisional mean score in validation studies of 50.7.<br><br>A single-point measure of life satisfaction was used for economy of survey length. Such measures are reliable[58] and valid[59], even when compared with multiple-item measures[60]. |

[*] The Warwick-Edinburgh Mental Well-being Scale was funded by the Scottish Executive National Programme for improving mental health and well-being, commissioned by NHS Health Scotland, developed by the University of Warwick and the University of Edinburgh, and is jointly owned by NHS Health Scotland, the University of Warwick and the University of Edinburgh.

| | | |
|---|---|---|
| | | The Duke-AD scale measures mental distress. Individuals attaining a raw score of 5 or more (of a possible 14) are at a high risk of clinically significant anxiety or depression. |
| **Mediators of well-being**<br><br>**(All respondents)** | • Diet: number of days per week respondents consumed 5 or more portions of fruit and vegetables<br>• Levels of physical activity, indoors or outdoors (number of minutes per week)<br>• Connection to nature (measured by the 'Inclusion of Nature in Self Scale' [61]) and<br>• The satisfaction of basic psychological needs when procuring and preparing food. | Good diet, physical activity, connection to nature and the satisfaction of basic psychological needs are known to be drivers of good mental health and multidimensional well-being. Existing studies and anecdotal evidence highlight a possible contribution to well-being via these mediators. |
| **Type of participation in local food projects**<br><br>**(If applicable to the respondent)** | • Duration of engagement with local food initiative, in years<br>• Type of participation (organisational or administrative capacity or consumers) | We hypothesised that participants engaged for longer would score higher on positive well-being measures.<br><br>We additionally sought to explore whether different types of engagement were associated with different well-being scores within the sample. |

Prior to data collection, ethical approval was sought via the Departmental Director of Research at Essex Business School. The questionnaire was piloted offline with ten respondents before deployment in order to test for clarity of the questions, time taken to answer them and to solicit general feedback. In its final version, the survey was prefaced by an overview of the study, and assurance to participants of confidentiality and anonymity. Respondents were briefed on our plans for storage of data, and assured that only the study team would have access to it. Finally, all respondents were given the researchers' contact details and invited to express any concerns [62; 63]. The survey ran for a 3-month period and had a high completion rate (ratio of users who

finished the survey) [63] with only 19 respondents proceeding beyond the initial consent form and then omitting to answer any questions.

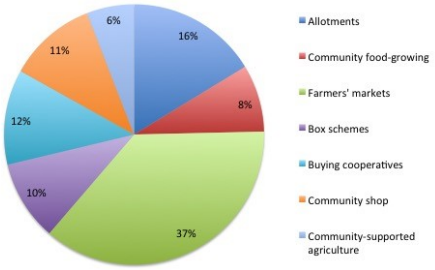
*Statistical analysis*

The aim of analysis was to identify significant differences between participants and non-participants in terms of well-being scores, and, to test for associations between types of participation and well-being outcomes. Qualtrics data was downloaded as an Excel file after the survey was closed, and then transferred to the software package IBM SPSS Statistics. Hierarchical ordinary least squares regression models were used to explore associations between participation and well-being scores. In a first step, we co-varied out three potentially relevant demographic variables: gender, age, and income (Tables 3 and 4). In a second step, participation was included as a predictor (in different models, because these predictors were highly collinear) [64]. Scores on the three well-being scales were then each regressed on to predictors.

## RESULTS

459 sets of responses were retained for analysis after removing 93 sets of responses where participants had omitted to answer a majority of the questions. Response-sets containing sporadic unanswered questions were retained. 302 of these self-identified as 'participants' in some form of initiative (Figure 2).

**Figure 2: Percentage of 491 respondents in seven different types of local food project: allotments, community food-growing, farmers' markets, box schemes, buying cooperatives, community shops and community-supported agriculture.**

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211 **Table 3: Respondents' characteristics across the sample, presenting demographic background**
212 **of the sample as a whole and comparing participants in local food projects with a control**
213 **group of non-participants.**
214
215

| Variable | Non-participants | Participants | Total sample | Statistically significant difference? |
|---|---|---|---|---|
| **Age (mean years)** | 43.81 (n = 144, SD = 15.2) | 47.63 (n = 280, SD = 13.9) | 46.33 (n = 424, SD = 14.4) | No significant difference |
| **Gender (n)** | | | | |
| Male | 58 | 96 | 154 | No significant difference |
| Female | 97 | 201 | 298 | |
| **Income (n)** | | | | |
| Below £10,000 | 37 | 78 | 115 | No significant difference |
| £10-20,000 | 40 | 69 | 109 | |
| £20-30,000 | 31 | 58 | 89 | |
| £30-40,000 | 20 | 43 | 63 | |
| £40-50,000 | 12 | 20 | 32 | |
| Above £50,000 | 10 | 23 | 33 | |
| **Diet (7-point scale)** | 3.86 days/week | 5.12 days/week | 4.75 days/week | Participants score higher: t = -5.558, p <0.0005 |
| **Nature connectedness (8-point scale)** | 3.73 | 4.50 | 4.28 | Participants score higher: t = -4.706, p <0.0005 |
| **Basic Need Satisfaction (7-point scale)** | | | | |

| | | | | |
|---|---|---|---|---|
| Autonomy | 3.06 | 3.53 | 4.39 (n = 369, SD = 1.51) | Participants score higher: t = -2.736, p = 0.007 |
| Competence | 2.84 | 3.58 | 4.36 (n = 368, SD = 1.45) | Participants score higher: t = -2.736, p = 0.007` |
| Relatedness | 2.05 | 3 | 3.73 (n = 368, SD = 1.59) | Participants score higher: t = -5.414, p < 0.0005 |
| **Physical Activity (days/week)** Indoors | 1.90 days/week | 1.91 days/week | 1.90 (n = 357, SD = 1.83) | No significant difference |
| Outdoors | 2.75 days/week | 3.10 days/week | 2.99 (n = 382, SD = 2.17) | No significant difference |

*H1: Participation in local food and scores on standardised well-being scales:*

Participants scored higher on measures of positive well-being – i.e. on life satisfaction, $t(346) = 2.30$, $p = .02$, $pr = .12$ and on the WEMWBS scale, $t(335) = 2.11$, $p = .03$, $pr = .12$. than non-participants. There was no statistically significant difference in Duke-AD scores between participants and the control group, $t(344) = -0.22$, $p = .82$, $pr = .01$.

*H2: Influence of intensity of participation on well-being scores:*

**Table 4: Summary of three covariates included in all models and their association with scores for Life Satisfaction, WEMWBS, Duke-AD, Nature Connectedness, Need Satisfaction and Outdoor Physical Activity and diet.**

| | **Age** | | **Gender** | | **Income** | |
|---|---|---|---|---|---|---|
| | *t, p* | *ρr* | *t, p* | *ρr* | *t, p* | *ρr* |
| Life satisfaction | 2.52, .01 | .13 | -0.32, .75 | -.17 | -0.29, .77 | -.02 |
| WEMWBS | 0.29, .78 | .06 | 0.73, .47 | .06 | 1.15, .25 | .10 |
| Duke-AD | -3.56, .001 | -.19 | 0.38, .70 | -.02 | -2.86, .004 | -.15 |
| Nature Connectedness | 3.36, .001 | -.18 | -0.50, .62 | -.02 | -3.78,.001 | -.20 |
| Need Satisfaction | 2.01, .04 | .11 | 0.02, .98 | .00 | 0.05, .36, | -.05 |
| Outdoor physical activity | 0.87, .39 | .07 | -1.01, .32 | -.08 | -0.34, .73 | -.03 |
| Diet | 4.89, .001 | .26 | 2.84, .005 | .15 | 0.68, .50 | .04 |

Controlling for demographics (Table 4), we found that participants who played an active role reported higher life satisfaction, $t(346) = 2.55$, $p = .01$, $\rho r = .14$, and WEMWBS scores, $t(335) = 2.12$, $p = .04$, $\rho r = .10$, than those who engaged solely as consumers. There was no link between participants' roles and their Duke-AD scores, $t(344) = -0.70$, $p = .49$, $\rho r = -.04$. Those participating for longer scored higher on life satisfaction, $t(148) = 2.02$, $p = .04$, $\rho r = .16$ and lower Duke-AD scores, $t(147) = -2.67$, $p = .008$, $\rho r = -.22$. Duration of participation did not influence scores on the WEMWBS scale, $t(142) = 1.86$, $p = .07$, $\rho r = .15$. While it could be argued that participants exposed to managerial tasks (e.g. accounting or sales) may have less direct exposure to nature than growers, it is also possible that such tasks provide opportunities for the satisfaction of basic

needs as well as increased social interaction and thus facilitate well-being through these pathways.

*H3: Mediators*

Participants felt more connectedness to nature than the control group ($t(339) = 4.90$, $p < .001$, $\rho r = .26$) and also experienced greater need satisfaction around food ($t(339) = 5.18$, $p < .001$, $\rho r = .27$). There were no significant differences between levels of physical outdoor activity between participants and non-participants ($t(340) = 1.27$, $p = .21$, $\rho r = .07$), possibly because our sample included participants from a wide range of local food initiatives, not all of which include a food-growing component (across our sample, discounting overlaps, just under 25% of participants were engaged in initiatives with a food-growing component, namely allotments and community food-growing). Participants also consumed more fruits and vegetables than non-participants ($t(348) = 5.36$, $p = .001$, $\rho r = .28$).

Finally, we tested for associations between levels of participation (intensity and duration) and these four mediators of well-being. Those who played a more engaged role in projects experienced greater connectedness to nature: $t(339) = 3.11$, $p = .002$, $\rho r = .17$, as well as greater need satisfaction, $t(339) = 3.79$, $p < .001$, $\rho r = .20$. There was no link between the duration of participation and psychological need satisfaction, $t(145) = 0.48$, $p = .63$, $\rho r = .04$, suggesting that even short-duration engagement with local food projects provided opportunities for autonomy, competence and relatedness, and associated well-being benefits. Finally, there was no link between outdoor physical activity and either the intensity of participation, $t(340) = 1.30$, $p = .20$, $\rho r = .07$, or the length of time participants engaged in local food projects, $t(145) = 1.02$, $p = .31$, $\rho r = .08$. Greater intensity of participation (i.e. taking part as an organiser) was associated with

higher fruit and vegetable intake, ($t$(348) = 2.86, $p$ < .001, $\rho r$ = .20), probably as a result of higher food and nutritional literacy and skilling, though the length of participation did not affect diet, $t$(149) = -0.36, $p$ = .72, $\rho r$ = .03).

Because there were no statistically significant links between participation and outdoor physical activity, further analysis focused only on links between diet, need satisfaction, connectedness with nature and participation. Indirect effects analysis tested for a significant indirect effect linking local food projects with well-being through these three proposed mechanisms *concurrently*. Further, because both the act of participation and its intensity were linked to life satisfaction and mental wellness (and these two indicators were themselves strongly correlated, $\rho r$ = .68), the two indicators of mental well-being were standardised and combined into a single indicator of positive well-being.

We found that connection to nature, $t$(326) = 3.92, $p$ < .001, $\rho r$ = .21, psychological need satisfaction, $t$(326) = 5.57, $p$ < .001, $\rho r$ = .30, and diet, $t$(326) = 3.03, $p$ = .003, $\rho r$ = .17 were positively associated with well-being. Controlling for these mediators resulted in the effect of local food on well-being, which we reported above, becoming non-significant, $t$(324) = 0.76, $p$ < .45, $\rho r$ = .04, suggesting that it was through their impact on need satisfaction and nature connection that local food initiatives influenced participants' psychological well-being. Bootstrapping analysis[65, 66] indicated indirect effects were present between participation and well-being through both mediators; the estimate of the indirect effect for nature connection was .097 with a 95% bootstrap confidence interval of .036 to .181, for need satisfaction was .156 with a 95% confidence interval of .081 to .254, and for diet, .080 with a 95% confidence interval of .025 to .158. These indirect effects support our hypothesis that involvement in local

292 food fostered a sense of well-being by encouraging people to feel a sense of connection with
293 nature, improved diets and provided psychological need satisfaction.
294
295 **DISCUSSION**
296
297 ***Main findings of this study***
298 Our three key findings are, first, that participation in local food projects is associated with higher
299 levels of positive well-being relative to a control group of non-participants. Within our sample,
300 there were no significant differences between participants' and non-participants' levels of
301 psychological distress – a finding we discuss at greater length below. Second, we find that
302 increased intensity of participation – proxied by duration and role – is associated with higher
303 well-being scores and lower levels of distress. Finally, our results suggest that these associations
304 derive from the satisfaction of basic psychological needs, better diet and increased connection
305 to nature.
306
307 The lack of significant differences in anxiety and depression scores between participants and the
308 control group possibly stems from the fact that the sample was drawn from the general (rather
309 than therapeutic) population. The absence of an effect does not however preclude the
310 relevance of local food initiatives within discussions of anxiety and depression amongst the
311 general public. First, in assisting positive well-being, local food initiatives may help to generate a
312 protective effect, as levels of life satisfaction and positive well-being predict the later onset of
313 depressive symptoms[67]. Food-based interventions – primarily food-growing and horticulture –
314 are already well-represented in the menu of nature-based activities partaken of by the general
315 population, and provide an important means by which nature may be incorporated into *daily life*

316 and harnessed as a means of health promotion[68]. Our findings support the extension of these
317 food-growing and food-related projects as a public health measure aimed at the general
318 population.
319
320 Second, the presence of symptoms of psychological distress does not preclude the enjoyment or
321 development of positive aspects such as positive affect or life satisfaction[15]. In other words, it is
322 possible for people experiencing mental ill-health to *also* enjoy positive mood, healthy self-
323 esteem and meaningful and enjoyable activities. For those within our sample who experience
324 intermittent or sub-clinical levels of anxiety or depression, the opportunity to participate in local
325 food projects may still enhance well-being even if levels of distress are not directly affected.
326 Finally, our results suggest that current and on-going participation increases perceptions of
327 happiness, but that for the more serious symptoms of depression and anxiety, it is important for
328 people to engage in the long term.
329
330 These findings resonate with recent evidence showing that engaging in pro-social behaviour
331 enhances well-being, likely through the mediating effects of autonomy and competence need
332 satisfaction[69]. The implication for practitioners is that giving people the opportunity to
333 participate more actively, such as by rotating organisational and leadership roles, may
334 contribute to greater well-being benefits.
335
336 ***What is already known about this topic***
337 The influence of environmental 'harms' to public mental health have been well-studied (e.g. for
338 air quality[70]; the effect of climate change on health[71, 72]; food-borne toxins and poor diets [18, 73,
339 [74]), there is now a growing recognition of the potential co-benefits of sustainability for *positive*

*well-being*, with scholars going 'beyond toxicity'[75], to assess the benefits of engaging with the natural environment and in initiatives that seek to 're-green' the human environment[76, 77, 78]. Local food initiatives are exemplars of such initiatives. Accordingly, previous studies have found that direct involvement in food growing in particular has clear relevance for well-being[4, 36, 37], particularly as a result of green exercise and connection to nature.

***What this study adds***

Our results extend the existing literature on the impacts of food-growing, focusing attention on the impacts of a broader array of local food initiatives, including those that do not involve a food-growing component. Across our sample, we find statistically significant differences in life satisfaction and WEMWBS scores between participants and non-participants across a range of different types of local food project, with participants scoring higher than non-participants. We have also found that longer duration participation is associated with higher life satisfaction and lower levels of distress, while higher intensity participation is associated with relatively higher levels of positive well-being.

The lack of an association between participation and outdoor physical activity is an important point of divergence between existing studies on food-growing and well-being. Our cohort of participants, engaging in community shops, community-supported agriculture and farmers' markets in addition to allotments and community gardens, may not have had the opportunity to engage directly in the physical activity of growing food, but as a group still have better well-being scores than non-participants. This is particularly relevant in urban areas, where planners may be hard-pressed to allocate land to new food-growing activities, or where practitioners may come up against difficult zoning or planning regulations while at the same time, the potential of

local food initiatives is increasingly investigated as a means of improving food self-sufficiency and delivering social and environmental goals[79].

***Limitations of this study***

Local food initiatives are complex interventions[80], consisting of multiple, interacting components, where outcomes are sensitive to the local context and with complex causal chains linking interventions with outcomes. We have made a start towards understanding the influence of mediators within our sample, but do not claim to have determined the extent of reverse causality – i.e. the extent to which connection to nature and high levels of well-being may be predisposing engagement in initiatives such as local food projects, and what, if any measures can be taken to increase participation. Instead, we have been able to present correlational evidence linking the broad spectrum of local food initiatives to well-being scores on standardised instruments, and highlighted the statistically significant role of three mediators in driving this association within our sample. A second limitation is that given the relatively low (albeit growing) numbers of participants in local food projects, our sampling approach relied in part on the use of known contacts, snowballing and convenience sampling to recruit respondents. Convenience sampling entails the risk of selecting a biased or unrepresentative sample. We were mindful of this during our communication with gatekeepers and contacts, limiting our recruitment efforts to publicising the survey and instructing email recipients to spread the survey link as broadly as possible amongst their networks of participants and non-participants. Combined with the use of print and social media to spread word of the survey, we thus received a wide range of responses from beyond our own networks.

Further research would need to include in-person surveys with a larger and more gender-balanced sample, exploration of differences between types of initiative, as well as international comparisons in comparable contexts. These comparisons would need to be structured to account for differences in key demographic characteristics, particularly socioeconomic status, which might play a significant role in enabling or constraining access to local food projects, or shape the role that participants are able to play. Differences between participants might be further explored by collecting data on location linked to, for example, the Index of Multiple Deprivation, as well as exploring differences in type of employment (affecting time availability and social capital). Finally, we suggest that longitudinal and multi-cohort studies are needed to explore mechanisms behind the impacts we have found within the sample, and testing the influence of additional mediators of well-being such as improved diet and social contact – both important determinants of well-being.

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