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296

297 **Fig 2. Three Likert statements as components of each of three different**
298 **motivations behind garden bird feeding;** a) psychological well-being benefits,
299 b) a concern about avian welfare and c) nature orientation. For each statement
300 we plotted the respondent's score (strongly disagree to strongly agree) against
301 how regularly they fed birds, because across statements this was the most
302 consist predictor of motivation (* Statements 6-9 were only completed by people
303 who fed birds).

304

305

306 Testing for welfare concerns, we found that the perception that there is not
307 enough natural food available for birds increased with the levels of bird feeding
308 and in respondents >60 years of age (Table 1d, Fig 2b). The sentiment that there
309 are enough people in my neighbourhood who feed birds decreased with the
310 frequency of bird feeding (Table 1d-e, Fig 2b). Overall, people who fed birds
311 regularly and people over 40 years were more likely to invest time taking
312 preventative measures against disease transmission by washing their feeders
313 regularly (Table 1f, Fig 2b).

314

315 Finally, testing for orientation towards interacting with nature, we found that
316 most people, but in particular those who put out food regularly, did so to try and
317 attract birds to their garden, putting out food whether birds were present or not
318 (Table 1g-h, Figs 2c). People who fed birds regularly were less likely to stop
319 putting out food if they could attract the same number of birds with bird-friendly
320 plants (Table 1i, Fig 2c). We did not find gender or income to be a significant
321 predictor of any statement.

322

323 A mixed effects ordinal regression of adjusted statement score against
324 motivation, suggested that based on the statements, the psychological benefits
325 were the strongest driver of bird feeding (Table 2, Fig 3). Nature orientation and
326 a concern about avian welfare were equally strong motivations (Table 2, Fig 3).

327

328 **Table 2. A mixed effects ordinal regression of statement score against**
 329 **motivation, while controlling for feeding activities.** We included the
 330 respondent's unique ID as a random effect. Coefficients show difference in
 331 motivation score relative to welfare, and bird feeding against those people who
 332 don't feed birds. Significant factor levels are shown as: ***P <0.001.
 333

<i>Factor level</i>	<i>Coefficient (CI)</i>	<i>t-value</i>
Psychological	0.35 (± 0.08)	4.4***
Orientation	0.06 (± 0.09)	0.5
Irregular feeding	0.81 (± 0.19)	4.2***
Regular feeding	1.86 (± 0.17)	10.8***

334

335

336 **Fig 3. Likert plots for each of the three motivations behind garden bird**
 337 **feeding.** Where necessary we reversed statement scores, so that a high score
 338 always indicates support for bird feeding and/or welfare. We then pooled
 339 statements by motivation.

340

341

342 Of the 56 people who never put out food for birds, 78% either disagreed or
 343 strongly disagreed with the statement 'I am not interested in feeding birds'
 344 (average score = 1.9 ± 1.2 (SE)). People who fed birds regularly (estimate = $-1.4 \pm$
 345 0.3 (SE), $p < 0.0001$) or were over 60 (estimate = -0.8 ± 0.4 (SE), $p = 0.02$) were
 346 less likely to forget to put out food.

347

348 **Discussion**

349 In an increasingly urbanized world the on-going separation of people from
 350 nature, 'the extinction of experience', is considered by many both a major public
 351 health risk [7,3] and a fundamental obstacle to halting and reversing the global
 352 biodiversity crisis [6,8]. It is a consequence of a behavioural shift towards people
 353 spending a greater proportion of time indoors or engaged in non-nature based
 354 activities [47,48]. This is also a period when the simple act of providing food for
 355 garden birds is increasing in popularity (e.g. [27]). Garden bird feeding has wider
 356 implications than supporting populations of often-common species, instead it is

357 increasingly being recognised as an important component of many people's daily
358 nature interactions [7,15,23-26]. If so, bird feeders may make excellent
359 'ambassadors' for engaging people with nature and halting the extinction of
360 experience. A small number of qualitative studies have started to explore the
361 possible motivations behind the rapid increase in bird feeding [21,25-26,49],
362 citing reasons such as feelings of pleasure [21,27] or deriving well-being by
363 adopting a warden-like role to their wildlife [26]. However, despite the
364 undoubted financial implications (see [27]) and impacts on avian welfare [22], it
365 is still unclear why so many invest their time and money feeding birds. Here, we
366 found that there were a variety of strong motivations, with evidence that the
367 associated self-reported psychological benefits were the strongest driver
368 (acknowledging that it is not possible to draw broader conclusions about these
369 motivations beyond those from the individual statements; although we have
370 mitigated much of the inherent bias within self-reported behaviour through
371 large sample sizes and an ordinal regression analytical approach, a degree of
372 caution must be exercised when interpreting self-reported motivations).

373

374 Understanding how different components of nature give rise to psychological
375 benefits is a key question in environmental psychology. The majority of
376 respondents agreed positively with the statements that: watching birds in their
377 garden made them feel relaxed and connected to nature. These feelings
378 increased in people who noticed birds around them for a greater proportion of
379 the day and who fed birds regularly. Stress is a major contributor towards
380 mental health issues such as depression and anxiety [50]. Here we show that the
381 act of maintaining and watching a bird feeder increased self-reported feeling of
382 relaxation, so contributing towards reduced levels of stress. Although we do not
383 show causation, we do not believe that it is too great a leap to conclude that
384 people who feed birds more regularly and feel connected to nature from doing so,
385 feel a deeper connection to nature. Watching birds at feeders and listening to
386 their song provide opportunities to reinforce this connection within one's own
387 garden [51-52]. Estimates have been made of how much people pay to receive
388 these and other benefits: for example, £240-290 million is spent annually on bird
389 seed in the UK, whilst the bird food industry in the US is estimated to be worth

390 \$4.5 billion [23]. As future research explores and quantifies the mental health
391 benefits of engaging with different aspects of nature, these values may be seen as
392 cost efficient investments.

393

394 We found that the perception that there is insufficient food available in the
395 natural environment increased with the frequency of bird feeding. While there
396 are doubtless complex relationships between people's perceptions and actions,
397 this would suggest that these participants believe that birds benefit from
398 supplementary food. Although the casual relationships are not easy to
399 disentangle, at face value this would imply that a concern about bird welfare is a
400 strong motivation behind bird feeding. Indeed, many people feel passionately
401 about the welfare of their garden birds [27], shown here by their willingness also
402 to invest time in offsetting associated risks, such as by following best practise
403 guides (e.g. [37]) to reduce the risk of the spread of disease. Encouragingly we
404 found that 58% of people agreed with the statement that they regularly wash
405 their feeders. However, this figure decreased in younger people and those that
406 only fed birds irregularly, suggesting that people's willingness to invest in
407 improving avian hygiene may be related to their availability of leisure time.

408

409 There is increasing evidence that the greater a person's orientation towards
410 nature the more they are motivated towards experiencing it, and that this can be
411 a stronger motivation than their opportunity for doing so [38]. Although we did
412 not measure orientation and opportunity directly, we show that people who fed
413 birds regularly would be willing to do so even if there were none currently in the
414 garden, and were less willing to lose the closer and more reliable human-wildlife
415 interaction a bird feeder provides such as by planting bird friendly plants. These
416 feelings decreased with levels of bird feeding, suggesting that people who fed
417 birds regularly were more orientated towards seeking this nature interaction
418 even when there was less immediate opportunity for doing so. Although we
419 show that bird feeding is an expression of nature orientation it is important to
420 acknowledge that it is only one of many different forms of connection to nature.

421

422 If feeding birds provides psychological benefits to so many people, then an
423 obvious question remains: why don't more people do it? Of the people in this
424 study that never provided food only 22% stated that they were not interested in
425 so doing. The strongest indicator that we found of a failure to feed birds was
426 simply that people didn't remember to do so, especially in respondents under 40
427 years who are likely to spend less of their leisure time around the home than
428 older respondents [53]. In line with other studies we found that the regularity of
429 bird feeding increased with age (e.g. [20-21]), with respondent's over 40 years
430 feeling more relaxed when watching birds in their garden than younger
431 counterparts. Older participants' preference for low arousal (e.g. relaxation) over
432 high arousal (e.g. excitement) emotions may increase in later life [54], suggesting
433 that the benefits of watching birds, and people's relationship to nature in general,
434 may vary across a person's life [55]. We did not find gender or income to be
435 significant predictors of motivation in any model, suggesting that amongst
436 people who feed birds such disparities are not important drivers.

437

438 In a world where people live increasingly urbanized lifestyles, the nature around
439 where they live and work forms a critical component of their daily nature
440 interaction. A major challenge in harnessing people's interest in local and
441 broader conservation issues is that many people simply do not notice the nature
442 that is around them [40]. A bird feeder has the potential to be a powerful tool for
443 people to make this connection, because it provides a focal location where
444 people both expect to and are able to observe birds and their behaviours.
445 However, the avian community level impacts of bird feeding vary geographically
446 [56-57] and as a consequence the activity is either supported or discouraged by
447 relevant national conservation organisations (reviewed [27]). Whatever the
448 position, the large number of people engaged in providing food for wild birds
449 suggests that there is a general desire within the wider population to engage
450 with the wildlife around them. Understanding people's motivations behind bird
451 feeding can open the door to public conversations about conservation
452 management strategies at the local, national and interational levels. Further, if
453 conservation organisations and city planners can maximise the benefits that

454 engaging with wildlife brings then the nature where people live has the potential
455 to contribute towards increased personal and social well-being.

456

457 **Supporting information captions**

458 **S1 File.** Test of whether two methods of data collection were comparable
459 **(Appendix A).** Birds and you **(Table A).** Birds in your garden **(Table B).** Why
460 you don't feed birds **(Table C).** Birds at your feeder **(Table D).** About you **(Table**
461 **E).** Demographic breakdown of the respondents, with comparative nationwide
462 data from UK Census 2011 **(Table Fa),** nature awareness of respondents **(Table**
463 **Fb).**

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