Article

Pet Ownership and Physical Activity in Older Adults:   
Cross-Sectional Analyses from the NICOLA Study

Ruth D. Neill 1,\*, Conor Cunningham 2, Maeve O’Doherty 1, Lee Smith 3 and Mark A. Tully 1

1 School of Medicine, Ulster University, Belfast BT15 1ED, UK; m.odoherty@ulster.ac.uk (M.O.);   
m.tully@ulster.ac.uk (M.A.T.)

2 School of Health Sciences, Ulster University, Belfast BT15 1ED, UK; c.cunningham1@ulster.ac.uk

3 School of Psychology and Sport Science, Anglia Ruskin University, Cambridge CB1 1PT, UK; lee.smith@aru.ac.uk

**\*** Correspondence: r.neill@ulster.ac.uk

**Abstract:** Aging research indicates that there is increased sedentary behaviour and insufficient physical activity levels across the older adult population. There is a growing body of evidence that suggests that pet ownership can have beneficial physical and mental health effects. Data were drawn from the Northern Ireland Cohort for the Longitudinal Study of Ageing (NICOLA) study. This questionnaire measured general social demographics such as gender, age, marital status while also examining elements of physical activity, lifestyle factors (drinking status, smoking status), and education. Two items from the short form International Physical Activity Questionnaire recorded moderate and vigorous activity. Respondents were asked if they owned a pet (Yes/No). The results are based on a secondary data analysis. An ordinal logistic regression revealed that an increase in moderate activity days was associated with pet ownership with an odds ratio of 0.111 (95% CI, −0.036 to 0.337), Wald ꭓ2 (1) 15.013, *p* < 0.001. An increase in vigorous activity days was associated with pet ownership with an odds ratio of 0.039 (95% CI, 0.004 to 0.342), Wald ꭓ2 (1) 8.952, *p* = 0.003). Amongst older adults in Northern Ireland, those with a pet were more likely to engage in regular physical activity. This study based on a small specific sample of the population showed differences in physical activity levels between pet owners and non-pet owners. Additionally the study showed that the physical activity is extremely low in the older adult population, therefore further investigation is warranted on the reasons for these low levels.

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1. Introduction

There is a high prevalence of pet ownership worldwide with over 500 million pets at home, which is estimated to be a pet at home in over half the world’s population [1]. In the United Kingdom approximately 52–62% of the general population own a pet [2–4]. Within the older adult population around half are pet owners [2]. Pets often offer a companionship, or a level of social connection to humans [5–7]. In older adults, pet ownership may increase when they reach retirement age as the individuals now have more time to give to a pet. Ageing research on older adults and pet ownership suggests that there are positive benefits on mental and physical wellbeing with pets helping emotional and social needs [8–12]. Friedmann et al. [11] reported that pet ownership was associated with better cognitive function and physical function than those who did not own pets or had no regular contact with pets.

There is a growing body of evidence that suggests that pet ownership can have beneficial physical and mental health effects such as improved life satisfaction reduced loneliness, improved well-being and reduced non-communicable diseases [5,13,14]. A study by Krauso-Darello et al. [15] noted that human animal interactions can play a therapeutic role in an older adults’ life. This suggests that pet ownership can be beneficial to older adults in a number of ways. Studies by McConnell et al. [7] found that pet ownership helped reduced negativity by providing mental and physical benefits to the owners while helping provide support and essential social needs. A population study in England involving over 68,000 adults assessing the association of dog ownership and mental health demonstrated that dog owners were less likely to have mental illness than non-dog owners but that the relationship is very complex [16]. Obradovic et al. [10] conducted a case study to explore the role of pet ownership in the daily lives of older adults. The study concluded that owning a pet could provide older adults with a sense of safety and positively influences mood. Similarly, a qualitative study by Gan et al. [17] suggested that pet ownership may be beneficial in older adults as it can influence positive outcomes, including providing a sense of comfort and safety; purpose, routine and structure; and a meaningful role for the owner. However, by contrast, a recent systematic review Scoresby et al. [5] suggested that there is significant variability in findings across studies and therefore the evidence does not fully support the benefits of pet ownership on health. Furthermore, other studies have found that pet ownership has a mixed relationship with health outcomes [13,17]. This variability in research findings highlights that pet ownership has many complexities and can be shaped by many different lifestyle factors such as physical activity. Research has shown that pet ownership has been associated with alleviating depression [9,15,18] and increasing physical activity levels [10,19].

The global populations levels of sedentary behavior have increased while levels of physical activity have decreased due to increased usage of technology, increased TV viewing, car usage, occupational reasons, and time spent sitting at home, amongst other factors [20–22]. These increasing levels of sedentary behavior and declining levels of physical activity are a public health concern as they present a major risk factor for increased mortality, non-communicable disease and poor mental health, as well as providing additional burden to the health care system costs [23–25]. Importantly, there is a plethora of literature to demonstrate that health benefits can occur with the uptake of regular and sustained physical activity which is why it is a vital daily element for all [26–28]. Higher levels of physical activity in adults and older adults improves the incidence of non-communicable health conditions, improves cognitive function, mental health, sleep, and hypertension, among other conditions [22,25–27,29–31]. Additionally, higher levels of physical activity may allow a healthier society and lower health care expenses [20,25,32–33]. This is particularly important as the increase in population aging worldwide has related in increased prevalence of age-related conditions which may impact health care systems. As people age, they become subject to more physical and mental changes which is why physical activity could play an important role in counteracting ill-health alongside pet ownership.

The World Health Organization [29] recommend adults between the ages of 18–64 years old and 65 years plus should engage in physical activity daily, with at least 150–300 min of moderate activity or 75–150 min of vigorous activity per week. However only approximately a quarter of the European older adult population globally engage in adequate levels of physically activity [34]. In Northern Ireland specifically, only 41% of participants aged 65–74 years and 10% of participants aged 75 years and older report meeting the 150 min a week moderate to vigorous physical activity guidelines [35]. Aging research indicates that there is increased sedentary behaviour and insufficient physical activity levels across the older adult population [36,37].

The literature suggests that those who are pet owners are more likely to participate in more regular physical activity [10,19]. Specifically, dog ownership has been associated with higher levels of physical activity in older adults [31,38–39]. Dog walking has been acknowledged as an additional way to get physical activity while providing stress relief particularly when recreational rather than functional [40]. Wu, Luben and Jones [41] that those who walked dogs consistently were more physically active than those who did not, with activity levels around 20% higher and less sedentary behaviour. This is particularly important as people age sedentary behaviour often increases therefore any physical activity is important in the ageing process and in the prevention and reduction of serious health conditions in late life.

Physical activity is closely linked with mental health and physical health, therefore increases in levels of physical activity due to pet ownership could be beneficial particularly to older adults. A study by Potter et al. [42] in the United States examined how dog ‘acquisition’ affects physical activity and psychosocial well-being. The authors reported that on average study participants had lower levels of stress and depressive symptoms while physical activity as measured by an Actigraph demonstrated increased moderate to vigorous physical activity levels by around 20 min a day.

While several studies have examined pet ownership and physical activity [38,42–44], the evidence around pet ownership and physical activity in older adults is still scarce. As such the aim of the present study was to compare the association of pet ownership and days of moderate and vigorous physical activity levels using secondary data analysis of a nationally representative sample from the Northern Ireland Cohort for the Longitudinal Study of Ageing (NICOLA) study. A secondary data analysis was used in this current study which seeks to extend upon the limited UK literature on physical activity and pet ownership in older adults (65 years and older). This study is unique as it is the first in Northern Ireland to explore this area. The goal of this research is to inform future papers involving physical activity and pet ownership in regard to public health and provide future suggestions.

2. Materials and Methods

2.1. Study Population

This study involves the use of the WAVE 1 data (collected between February 2014–March 2016) from the NICOLA study, a longitudinal study involving a stratified random sample of 8478 men and women aged 50 years and over exploring why and how certain social, economic and biological factors are impacting the lives of older adults. NICOLA is an ongoing longitudinal cohort study of ageing in Northern Ireland designed to complement the English Longitudinal Study of Ageing (ELSA) and the Irish Longitudinal Study of Ageing (TILDA). The aim of the NICOLA study is to monitor older adults and examine health, lifestyle, and wellbeing changes over a 10-year period. Participation in the study was completely voluntary. Participants were recruited at random from the POINTER address database or GP Register in Northern Ireland with letters sent to the household. Consent for the study was obtained from all study participants before the commencement of the research with a double side form getting participants consent that they understand the study and that they consent for each process of the testing. Ethical approval was obtained by the School of Medicine, Dentistry and Biomedical Sciences Ethics Committee, Queen’s university Belfast (SREC 12/23) and the study conducted according to the guidelines of the Declaration of Helsinki. All participant data was given a unique code so that the data remained anonymous. This secondary data analysis study will only contain the data for adults aged 65 years and older from the NICOLA study (n = 4040).

2.2. Data Collection

The NICOLA study comprised of three elements of data collection: (1) a computer Assisted Personal Interview (CAPI), (2) a Self-Completion Questionnaire (SCQ) and (3) a health assessment which were performed at the Northern Ireland Clinical Research Facility. This secondary data analysis study used data from the results of the Computer Assisted Personal Interview (CAPI) and the Self Completed Questionnaires from the WAVE 1 of the NICOLA study. Details of NICOLA study assessments can be found online at https://www.qub.ac.uk/sites/NICOLA/ (accessed on).

**Socio-demographics:** This questionnaire measured general social demographics such as gender (male or female), age (65 > 85 years or 85 and older), marital status (single, married, separated, divorced, widowed, living together) while also examining elements of physical activity (moderate or vigorous days physically active), lifestyle factors (smoking and drinking status), and education.

**Physical Activity:** This analysis used physical activity components from the NICOLA study which focused on two items from the short form International Physical Activity Questionnaire [45]. These items recorded moderate physical activity (During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking) and vigorous activity (During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?).

**Pet-related variable:** Respondents were asked if they owned a pet (Yes/No).

2.3. Data Analysis

The data presented here is based on a secondary data analysis. The data was reviewed and any participant under the age of 65 was excluded from the data analysis (n = 4098). Additionally, those respondents not answering the physical activity items were removed from the dataset (n = 58). This left a sample of 4040 participants to examine the influence of pet ownership on moderate and vigorous physical activity. All statistical analysis was conducted on SPSS (IBM SPSS Software, Version 28, IBM Corp, Armonk, NY, USA). Summary statistics for variables were reported for the cohort with variables being categorial reported in frequencies and percentages. Data were not normally distributed (*p* < 0.005), therefore a chi squared test was conducted to explore the differences between the two categorical variables for pet ownership and days of physical activity. This test was used to see if pet ownership was associated with physical activity Additional subgroup analysis was examined with age and gender using chi-square toexplore the differences in pet ownership and physical activity. Cramers V was used alongside the chi-squared to examine the association between the two categorical variables as the effect size, in this study small = 0.07, medium = 0.21, and larger = 0.35. The physical activity variables for vigorous and moderate were recoded in binary variables for each labelled 0 (not sufficiently active) and 1 (sufficiently active). A ordinal logistic regression was used to examine pet ownership on physical activity levels with covariates age and gender. For the secondary data analysis, the cross-sectional results of the ordinal regression are reported as odds ratios with 95% confidence intervals which can be interpreted as the increase in odds of pet ownership associated with increase moderate or vigorous physical activity levels. The significance level was assessed as a p-value of <0.05 considered statistically significant. Details of NICOLA study dataset can be found online at https://www.qub.ac.uk/sites/NICOLA/ (accessed on) with access to the data available by application through https://www.qub.ac.uk/sites/NICOLA/InformationforResearchers (accessed on).

3. Results

Descriptive statistics regarding the sociodemographic and study characteristics of the study sample (n = 4040) are shown in Table 1. The table shows that over half respondents were female (n = 2145, 53.1%) slightly more than male respondents, a majority were in the 65 to < 85 years old category (n = 3699, 91.6%). A third of the group had primary or some primary education (n = 1343, 33.2%) with the next largest group having completed GCSE/Intermediate/Junior/Group certificate of equivalent education status (n = 1296, 32.1%). Over half did not own a pet (n = 2739, 67.8%). Over half of the respondents were married (n = 2391, 59.2%), with 48.6% never smoking (n = 1964) while 50.4% (n = 2038) would have a drink of a regular basis. A total 86.8% of those who did not own a pet did not take part in any vigorous physical activity which is a higher percentage than those who did own a pet (84.6%). In relations to moderate physical activity, 70.7% of respondents who did not own a pet were not physically active, again higher than the 68.4% of those who owned a pet but were not physically active at all during the week.

**Table 1.** Socio-demographic and outcome variables (n = 4040).

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Overall (n = 4040)** | **Owned Pet  (n = 1301)** | **No Pet (n = 2739)** |
| **Gender** | | | |
| Male | 1894 (46.9%) | 630 (48.4%) | 1264 (46.1%) |
| Female | 2145 (53.1%) | 671 (51.6%) | 1475 (53.9%) |
| **Age** | | | |
| 65 to <85 years old | 3699 (91.6%) | 1235 (94.9%) | 2464 (90.0%) |
| 85 years and older | 341 (8.4%) | 66 (5.1%) | 275 (10.0%) |
|  | **Smoking Status** |  |  |
| Current | 524 (13.0%) | 191 (14.7%) | 333 (12.2%) |
| Ex | 1546 (38.3%) | 529 (40.7%) | 1017 (37,1%) |
| Never | 1964 (48.6%) | 580 (44.6%) | 1384 (50.5%) |
| Refused | 6 (0.1%) | 1 (0.1%) | 5 (0.2%) |
|  | **Drinking Status** |  |  |
| Current | 2038 (50.4%) | 693 (53.3%) | 1345 (49.1%) |
| Ex | 893 (22.1%) | 274 (21.1%) | 619 (22.6%) |
| Never | 1102 (27.3%) | 332 (25.5%) | 770 (28.1%) |
| Refused | 7 (0.2%) | 2 (0.2%) | 5 (0.2%) |
|  | **Education** |  |  |
| Primary or some primary | 1343 (33.2%) | 445 (34.2%) | 898 (32.8%) |
| GCSE/Intermediate/Junior/Group certificate or equivalent | 1296 (32.1) | 431 (33.1%) | 865 (31.6%) |
| A-level/Leaving certificate or equivalent | 289 (7.2%) | 91 (7.0%) | 198 (7.2%) |
| Dipolma/Certificate | 460 (11.4%) | 147 (11.3%) | 313 (11.4%) |
| Primary degree | 247 (6.1%) | 74 (5.7%) | 173 (6.3%) |
| Postgraduate/higher degree | 228 (5.6%) | 55 (4.2%) | 173 (6.3%) |
| None or refused | 177 (4.4%) | 58 (4.5%) | 119 (4.5%) |
| **Marital Status** | | | |
| Married or living as married | 2391 (59.2%) | 861 (66.2%) | 1539 (55.9%) |
| Single | 382 (9.5%) | 108 (8.3%) | 274 (10.0%) |
| Separated, divorced or widowed | 1267 (31.4%) | 332 (25.5%) | 935 (34.1%) |
| **Moderate PA (over last 7 days)** | | | |
| None | 3479 (86.1%) | 890 (68.4%) | 1937 (70.7%) |
| 1–2 days | 283 (7.0%) | 151 (11.6%) | 375 (13.7%) |
| 3–4 days | 135 (3.3%) | 93 (7.1%) | 189 (6.9%) |
| 5–6 days | 56 (1.4%) | 46 (3.5%) | 98 (3.6%) |
| Everyday | 87 (2.2%) | 121 (9.3%) | 140 (5.1%) |
| **Vigorous PA (over last 7 days)** | | | |
| None | 2827 (70.0%) | 1101 (84.6%) | 2378 (86.8%) |
| 1–2 days | 526 (13.0%) | 98 (7.5%) | 185 (6.8%) |
| 3–4 days | 282 (7.0%) | 41 (3.2%) | 94 (3.4%) |
| 5–6 days | 144 (3.6%) | 16 (1.2%) | 40 (1.5%) |
| Everyday | 260 (6.4%) | 45 (3.5%) | 42 (1.5%) |

For the overall sample, only 10.0% of respondents (n = 405) were moderately active on five days or more per week, whereas only 3.5% (n = 143) met the guidelines for being sufficiently vigorously active per week. As shown in Table 1, over 70% of the overall sample did not partake in regular vigorous activity while 86.1% stated they did had participated in no moderate physical activity over the last seven days. There was a higher percentage of pet owners who met the guidelines for moderate physical activity weekly (12.8%) in comparison to non-pet owners (8.7%) as shown in Figure 1. This was similar for weekly vigorous physical activity, in which pet owners had a higher percentage (4.7%) than those who were non pet owners (3.0%) as shown in Figure 2.

Chart, bar chart

Description automatically generated

**Figure 1.** Pet ownership and whether respondents were sufficiently moderately active.

Chart, bar chart

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**Figure 2.** Pet ownership and whether respondents were sufficiently vigorously active.

Data were not normally distributed and therefore chi-squared tests were used to examine differences in physically activity by pet ownership. The association between pet ownership and days moderately physically active was significant, X2 (4, N = 4040) = 27.66, *p* < 0.001, Cramer’s V = 0.083. This suggests that those who had a pet were more likely to have a higher number of days moderately physically active than those who did not own a pet. Similarly, days when taking part in vigorous physical activity and owning a pet was shown to be significant, X2 (4, N = 4040) = 16.99, *p* = 0.002, Cramer’s V = 0.065. This suggests that those who had a pet were more likely to have a higher number of days completing vigorous physical activity than those who did not own a pet.

A subgroup analysis examining gender and age were conducted to examine differences in pet ownership and physical activity levels. In terms of physical activity levels, the association between gender and days moderately physically active was significant, X2 (4, N = 4040) = 25.53, *p* < 0.001, Cramer’s V = 0.079. The association between gender and days vigorously physically active was significant, X2 (4, N = 4040) = 44.19, *p* < 0.001, Cramer’s V = 0.105. With males being significantly more active than females. In addition, on further analysis with males (*p <* 0.001) and females (*p* = 0.026) with a pet were significantly more likely to be sufficiently moderately physically active. However, in terms of vigorous physical activity and pet ownership there was no significant difference between females (*p =* .451).

In terms of age, there was a significant difference in days moderately vigorously active (X2 (4, N = 4040) = 13.07, *p <* 0.001, Cramer’s V = 0.057) and vigorously active (X2 (4, N = 4040) = 9.51, *p <* 0.001, Cramer’s V = 0.079), with those in the 65 to less than 85 age group more active than those in the 85 years and older age group. In addition, on further analysis in the subgroups 65 to 85 (*p <* 0.001) and 85 year and older (*p <* 0.001) with a pet were significantly more likely to be sufficiently moderately physically active. However, in terms of vigorous physical activity and pet ownership there was no significant difference between those in the 85 years age and older age group (*p =* 0.694).

An ordinal logistic regression revealed that an increase in moderate activity days was associated with pet ownership with an odds ratio of 0.111 (95% CI, −0.036 to 0.337), Wald ꭓ2 (1) 15.013, *p <* 0.001. An increase in vigorous activity days was associated with pet ownership with an odds ratio of 0.039 (95% CI, 0.004 to 0.342), Wald ꭓ2 (1) 8.952, *p =* 0.003).

4. Discussion

The NICOLA study is a longitudinal study of aging in Northern Ireland. The aim of the present study was to conduct a secondary data analysis to compare the association of pet ownership and days of moderate and vigorous physical activity levels of older adults (65 years and older) in Northern Ireland Previous studies have considered pet ownership and mental health variables such as depression which is why this study chose to focus on physical activity variables. Our results show that pet ownership has a positive influence on the physical activity levels of older adults (*p <* 0.005). However, even those who have pets were not often considerably physically active. Overall while the findings showed a significant difference between pet ownership and level of moderate/vigorous physical activity, the findings for meeting sufficient levels of physical activity are very low. For the overall sample only 10.0% of respondents met the five days or more a week that they were sufficiently moderately active, whereas only3.5% met the guidelines for being sufficiently vigorously active a week. There was a higher percentage of pet owners who met the guidelines for moderate physical activity weekly (12.8%) in comparison to non-pet owners (8.7%). This was similar for weekly vigorous physical activity, in which pet owners had a higher percentage (4.7%) than those who were non pet owners (3.0%) On comparison with previous Northern Ireland data for older adults of 41% [35] this figure is alarmingly low.

Similarly, a study by Park et al. [46] found that dog walkers had significantly higher physical activity levels than non-dog-walkers though this study included Korean older adults with a mean age of 42–45 years old, therefore generalisations cannot be made with this study. Machova et al. [43] also reported a significant difference in dog owners’ levels of physical activity compared to non-pet owners. While our current study does not specify the type of pet, similarities can be made between these findings as both show significant differences in physical activity levels, with higher activity levels being shown in those with pets and lower activity levels in those without pets. While not in older adults the study by Machova et al. [43] found that people who owned a pet had higher levels of moderate to vigorous physical activity than those who did not own a pet. However, this cannot be generalized across the older adult population, but it does highlight the impact pet ownership may have on physical activity levels. Peacock et al. [47] explored the association between pet ownership and incidental and purposeful physical activity. The authors noted that physical activity occurred as a result of the pet-owners looking after their pets. These findings could link with why those pet owners in this study had a slightly higher level of physical activity than non-pet owners.

Interestingly an early study in 2006, by Thorpe et al. [39] found that dog owners differed in terms of physical activity compared to those non-pet owners, however those pet owners that were not dog walkers did not differ from non-pet owners. Furthermore, a study by Albright, Cui and Allen [9] found that dog owners had better subjective health and were more like to take part in exercises such as walking than their non-pet owner counterparts. Shibata et al. [31] reported how important physical activity was in older adults and that those pet owners who had dogs were more likely to be sufficiently active than non-pet owners. For example, a survey in 2019 in Northern Ireland highlighted that a majority of pet owners were dog owners at 31% higher than any other type of pet [48]. This indicates that the type of pet may have an influence on the levels of physical activity which should be examined in any further longitudinal studies. However, a similarity with this study is that pet owners were more likely to be sufficiently active. Overall while significant differences may be evident in this study, both groups had relatively low moderate to vigorous physical activity levels, therefore pet ownership may not necessarily explain higher levels of physical activity. While the secondary analysis showed significant differences similar to the studies discussed above, there were slight differences in results between our study and these previous studies. For example, different styles of questions were asked in regards of pet ownership and type of pet and differences were evident in the age range allowed for age study as each country had slightly different ages for their older adult sample.

There are several possible avenues for future research. Firstly, an investigation into the effect of pet ownership on wellbeing and mental health could be important to explore and would help further explain why physical activity levels in this age group are currently alarmingly low. Secondly, exploring the association between pet ownership and physical activity measured longitudinally with Actigraph. Thirdly, assessment of pet ownership with types of sporting activity and whether the participants attend the gym, fitness classes or are a part of a sporting group or activity.

Limitations

This is the first secondary analysis study in Northern Ireland, to our knowledge, which explores the association between pet ownership and levels of moderate or vigorous activity levels in older adults aged 65 years and older. Strengths of the study include findings on the older adult population who can be a hard to reach population, the sample size was large, and the gender split of the sample was very similar. A secondary data analysis helped understand the nature of working with older adults and enabled the researchers to answer certain research questions. However while these analysis benefited from the use of a nationally representative dataset for older adults, there are several limitations that must be acknowledged.

Conducting a secondary data analysis can be beneficial due to leading to the ability to access data on larger samples that individuals would not normally be able to reach. However secondary data analysis has its challenges as the researchers in this study did not collect the data and therefore have no control over what is contained in the dataset. Within the dataset, specific variables were collected in categories rather than a continuous variable which is differently than we may have chosen. In this study we used cross-sectional data as the longitudinal data was not yet available and thus the direction of the association cannot be established [49]. The findings of this study are not representative of the general population and the overall older adult population across the United Kingdom; however, it does provide insight into this topic and therefore may spark further insights for future research. The self-reported nature of the data is subjective therefore we cannot exclude over or under reporting of physical activity. Additionally, accelerometer data which is objectively measured would be beneficial in calculating physical activity levels. Future studies should also include a comparison between the types of pets owned and levels of physical activity.

5. Conclusions

An active lifestyle involving physical activity is essential as adults age to allow them to live healthy lives and reduce/prevent poor physical and mental health conditions. However, as shown in the study only a small percentage of older adults were reaching sufficient weekly activity levels. Those older adults who own a pet showed significantly higher physical activity at both moderate and vigorous intensity levels which suggests that pet ownership could be important in the ageing population. Furthermore, there were differences in pet ownership and physical activity (moderate levels) across gender and age categories. However, the type of pet owned could influence this and therefore this is something that should be examined further. Pet ownership has many different factors impacting it such as type of pet as some pets such as dogs can be taken for walks thereby possibly increasing activity levels. Therefore, future research is warranted to establish the true extent of the relationship between these variables with a qualitative study to further explore how owning a pet could increase physical activity levels by also examining the type of pet ownership.

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**Informed Consent Statement:** Consent for the study was obtained from all study participants before the commencement of the research. All participants in the original study (NICOLA project) agreed to data to be used for publications.

**Data Availability Statement:** The data from the Northern Ireland Cohort for Longitudinal Ageing (NICOLA) are available but restrictions apply to the dataset, Data access is available through the UK Data Archive (https://www.data-archive.ac.uk/ (accessed on)).

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References

1. Health for Animals. Available on : <https://www.healthforanimals.org/reports/pet-care-report/global-trends-in-the-pet-population/#ownership> (accessed 24th February 2023).
2. Batty, G.D., Zaninotto, P, Watt, R.G., Bell, S. Associations of pet ownership with biomarkers of ageing: population based cohort study. *bmj.* **2017** Dec 13;359. doi: <https://doi.org/10.1136/bmj.j5558>
3. Statistica. Available on: <https://www.statista.com/statistics/308218/leading-ten-pets-ranked-by-household-ownership-in-the-united-kingdom-uk/> (accessed 24th February 2023).
4. PDSA. Available on: <https://www.pdsa.org.uk/what-we-do/pdsa-animal-wellbeing-report/uk-pet-populations-of-dogs-cats-and-rabbits> (accessed 24th February 2023).
5. Scoresby, K.J.; Strand, E.B.; Ng, Z.; Brown, K.C.; Stilz, C.R.; Strobel, K.; Souza, M. Pet Ownership and Quality of Life: A Systematic Review of the Literature. *Veterinary Sciences,* **2021***. 8(12),* 332.
6. Bussolari, C.; Currin-McCulloch, J.; Packman, W.; Kogan, L.; Erdman, P. “I couldn’t have asked for a better quarantine partner!”: Experiences with companion dogs during Covid-19. *Animals.* **2021** Jan 28;11(2):330.
7. McConnell, A.R.; Brown, C.M.; Shoda, T.M.; Stayton, LE.; Martin, C.E. Friends with benefits: on the positive consequences of pet ownership. *Journal of personality and social psychology.* **2011** Dec;101(6):1239.
8. Applebaum, J.W.; Ellison, C.; Struckmeyer, L.; Zsembik, B.A.; McDonald, S.E. The impact of pets on everyday life for older adults during the COVID-19 pandemic. *Frontiers in public health.* **2021** Apr 9;9:652610.
9. Albright, A. E.; Cui, R.; Allen, R.S. Pet ownership and mental and physical health in older White and Black males and females. *International journal of environmental research and public health,* **2022** *19(9),* 5655.
10. Obradović, N.; Lagueux, É.; Latulippe, K.; Provencher, V. Understanding the Benefits, Challenges, and the Role of Pet Ownership in the Daily Lives of Community-Dwelling Older Adults: A Case Study. *Animals,* **2021.** *11(9),* 2628.
11. Friedmann, E.; Gee, N.R.; Simonsick, E.M.; Studenski, S.; Resnick, B.; Barr, E.; Kitner-Triolo, M.; Hackney, A. Pet ownership patterns and successful aging outcomes in community dwelling older adults. *Frontiers in Veterinary Science.* **2020** Jun 25;7:293.
12. Enders-Slegers M.J.; Hediger, K. Pet ownership and human–animal interaction in an aging population: Rewards and challenges. *Anthrozoös.* **2019** Mar 4;32(2):255–65.
13. Gee, N.R.; Mueller, M.K. A systematic review of research on pet ownership and animal interactions among older adults. *Anthrozoös,* 2019. *32(2),* 183–207.
14. Brooks, H.L.; Rushton, K.; Lovell, K.; Bee, P.; Walker, L.; Grant, L.; Rogers, A. The power of support from companion animals for people living with mental health problems: a systematic review and narrative synthesis of the evidence. *BMC psychiatry,* **2018***. 18(1),* 1–12.
15. Krause-Parello, C.A.; Gulick, E.E.; Basin, B. Loneliness, depression, and physical activity in older adults: The therapeutic role of human–animal interactions. *Anthrozoös.* **2019** Mar 4;32(2):239–54. DOI: [10.1080/08927936.2019.1569906](https://doi.org/10.1080/08927936.2019.1569906)
16. Liu, S.; Powell, L.; Chia, D.; Russ, T.C.; McGreevy, P.D.; Bauman, A.E.; Stamatakis, E. Is dog ownership associated with mental health? A population study of 68,362 adults living in England. *Anthrozoös,* **2019**. *32(6),* 729–739.
17. Hui Gan, G.Z.; Hill, A.M.; Yeung, P.; Keesing, S.; Netto, J.A. Pet ownership and its influence on mental health in older adults. *Aging & mental health,* **2020**. *24(10),* 1605–1612.
18. Sharpley C, Veronese N, Smith L, López-Sánchez GF, Bitsika V, Demurtas J, Celotto S, Noventa V, Soysal P, Isik AT, Grabovac I. Pet ownership and symptoms of depression: A prospective study of older adults. Journal of Affective Disorders. 2020 Mar 1;264:35–9.
19. Rijken, M.; van Beek, S. About cats and dogs… Reconsidering the relationship between pet ownership and health related outcomes in community-dwelling elderly. *Social Indicators Research,* **2011**. *102(3),* 373–388.
20. Hall, G.; Laddu, D.; R., Phillips, S. A.; Lavie, C. J.; Arena, R. A tale of two pandemics: How will COVID-19 and global trends in physical inactivity and sedentary behavior affect one another?. *Progress in cardiovascular diseases,* **2021.** *64,* 108.
21. Jorstad, H.T.; Piek, J.J. Physical inactivity in times of a pandemic: another curve to flatten. *Netherlands Heart Journal,* **2021,** *29*(5), 241–242
22. Le Roux, E. ; De Jong, N.P. ; Blanc, S. ; Simon, C. ; Bessesen, D.H. ; Bergouignan, A. Physiology of physical inactivity, sedentary behaviours and non-exercise activity: insights from the space bedrest model. *The Journal of Physiology,* **2022**. *600(*5), 1037–1051.
23. Costa Santos, A.; Willumsen, J.; Meheus, F.; Ilbaw, A.; Bull, F.C. The Cost of Inaction on Physical Inactivity to Healthcare Systems. Available at SSRN 4248284. **2022** Jun 27.
24. Heron, L.; Tully, M. A.; Kee, F.; O’Neill, C. Inpatient care utilisation and expenditure associated with objective physical activity: econometric analysis of the UK Biobank. *The European journal of health economics* **2022.** https://doi.org/10.1007/s10198–022-01487–1.
25. Ding, D., Lawson, K. D., Kolbe-Alexander, T. L., Finkelstein, E. A., Katzmarzyk, P. T., van Mechelen, W., Pratt, M., & Lancet Physical Activity Series 2 Executive Committee (2016). The economic burden of physical inactivity: a global analysis of major non-communicable diseases. *Lancet,* **2016.** *388*(10051), 1311–1324.
26. World Health Organisation. Available online: <https://apps.who.int/iris/bitstream/handle/10665/337001/9789240014886-eng.pdf> (Accessed 19th October 2022).
27. Malm, C.; Jakobsson, J.; Isaksson, A. Physical Activity and Sports-Real Health Benefits: A Review with Insight into the Public Health of Sweden. *Sports,* **2019,** *7(5),* 127.
28. Warburton, D.E.; Nicol, C.W.; Bredin, S.S. Health benefits of physical activity: the evidence. *Cmaj,* **2006***, 174(6),* 801–809.
29. World Health Organization. Available on : <https://www.who.int/news-room/fact-sheets/detail/physical-activity> (accessed 19th October 2022).
30. Taylor, D. Physical activity is medicine for older adults. *Postgraduate medical journal,* **2014,** *90(1059),* 26–32.
31. Shibata, A.; Oka, K.; Inoue, S.; Christian, H.; Kitabatake, Y.; Shimomitsu, T. Physical activity of Japanese older adults who own and walk dogs. *American Journal of Preventive Medicine,* **2012,** *43(4),* 429–433.
32. Su, C.L.;Wang, L.; Ho, C.C.; Nfor, O.N.; Hsu, S.Y.; Lee, C.T.; Liaw, Y.P. Physical activity is associated with lower health care costs among Taiwanese individuals with diabetes mellitus. *Medicine,* **2020**. *99(14).*
33. Towne Jr, S.D.; Li, Y.; Lee, S.; Smith, M.L.; Han, G.; Quinn, C.; Ory, M.G. Physical activity and associated medical cost savings among at-risk older adults participating a community-based health & wellness program. *PLoS one,* **2018.** *13(6),* e0198239.
34. Giné-Garriga, M.; Sansano-Nadal, O.; Tully, M.A.; Caserotti, P.; Coll-Planas, L.; Rothenbacher, D.; Dallmeier, D.; Denkinger, M.; Wilson, J. J.; Martin-Borràs, C.; Skjødt, M.; Ferri, K.; Farche, A. C.; McIntosh, E.; Blackburn, N. E.; Salvà, A.; Roqué-I-Figuls, M. Accelerometer-Measured Sedentary and Physical Activity Time and Their Correlates in European Older Adults: The SITLESS Study. *The journals of gerontology. Series A, Biological sciences and medical sciences,* **2020.** *75(9),* 1754–1762. <https://doi.org/10.1093/gerona/glaa016>
35. Cunningham, C.; O’Sullivan, R. Physical activity and older adults: An overview of guidelines, trends, policies and frameworks. Institute of Public Health in Ireland: Dublin/Belfast. **2019.**
36. Mattle, M.; Meyer, U.; Lang, W.; Mantegazza, N.; Gagesch, M.; Mansky, R.; Kressig, R.W.; Egli, A.; Orav, E.J.; Bischoff-Ferrari, H.A. Prevalence of Physical Activity and Sedentary Behavior Patterns in Generally Healthy European Adults Aged 70 Years and Older—Baseline Results From the DO-HEALTH Clinical Trial. *Frontiers in public health.* **2022;***10.*
37. Rojer, A.G.; Ramsey, K.A.; Gomes, E.S.A.; D’Andrea, L.; Chen, C.; Szoeke, C.; Maier, A.B. Objectively assessed physical activity and sedentary behavior and global cognitive function in older adults: a systematic review. *Mechanisms of ageing and development,* **2021***. 198,* 111524.
38. Feng, Z.;Dibben, C.; Witham, M.D.; Donnan, P.T.; Vadiveloo, T.; Sniehotta, F.; McMurdo, M.E. Dog ownership and physical activity in later life: A cross-sectional observational study. *Preventive Medicine,* **2014,** *66,* 101–106.
39. Thorpe, R.J.; Kreisle, R.A.; Glickman, L.T.; Simonsick, E.M.; Newman, A.B.; Kritchevsky, S. Physical activity and pet ownership in year 3 of the Health ABC study. *Journal of aging and physical activity,* **2006**. *14(2),* 154–168.
40. Westgarth. C.; Christley, R.M.; Marvin, G.; Perkins, E. Functional and recreational dog walking practices in the UK. *Health promotion international.* **2021** Feb;36(1):109–19.
41. Wu, Y.T.; Luben, R.; Jones, A. Dog ownership supports the maintenance of physical activity during poor weather in older English adults: cross-sectional results from the EPIC Norfolk cohort. *J Epidemiol Community Health.* **2017** Sep 1;71(9):905–11.
42. Potter, K; Teng, J.E.; Masteller, B.; Rajala, C.; Balzer, L. B. Examining how dog ‘acquisition’affects physical activity and psychosocial well-being: findings from the buddystudy pilot trial. *Animals,* **2019.** *9(9),* 666.
43. Machová, K.; Daďová, K.; Chaloupková, H.; Svobodová, I. Does having a pet influence the physical activity of their young female owners?. *BMC Public Health,* **2019,** *19(1),* 1–7.
44. Westgarth, C.; Christley, R. M.; Jewell, C.; German, A.J.; Boddy, L.M.; Christian, H.E. Dog owners are more likely to meet physical activity guidelines than people without a dog: An investigation of the association between dog ownership and physical activity levels in a UK community. *Scientific reports,* **2019**. *9(1),* 1–10.
45. Craig, C.L.; Marshall, A.L.; Sjöström,M.; Bauman, A.E.; Booth, M.L.; Ainsworth, B.E.; Oja, P. International physical activity questionnaire: 12-country reliability and validity. *Medicine and science in sports and exercise,* **2003,** *35(8),* 1381–1395.
46. Park, M.; Park, H.K.; Hwang, H.S.; Park, K.Y.; Yim, H.H. The relationship between dog ownership and physical activity in korean adults. *Korean journal of family medicine.* **2021** Jan;*42(1):*59.
47. Peacock, M.; Netto, J.; Yeung, P.; McVeigh, J.; Hill, A.M. Understanding the relationship between pet ownership and physical activity among older community-dwelling adults—A mixed methods study. *Journal of aging and physical activity.* **2020** Feb 1;28(1):131–9.
48. Statista. Pet ownership by UK Region. Available online: <https://www.statista.com/statistics/875940/pet-ownership-by-region-uk/> (accessed 2nd Nov 2022).
49. Wang, X.; Cheng, Z. Cross-sectional studies: strengths, weaknesses, and recommendations. *Chest.* **2020** Jul 1;*158*(1):S65–71.

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