# *Supplementary Material*

## Demographic variables of dog and owner

### **Table 1**: Description of categorical questions concerning the dogs and their owners (N=1207), and percentage breakdown of the groups. (BCS: Body condition score)

|  |  |  |  |
| --- | --- | --- | --- |
| **Title and description** | **Categorical Variable labels:** | **Count** | **%** |
| **Age group** | Group One: 1 - 3 years | 185 | 15.3 |
| Group Two: >3 - 6 years | 251 | 20.8 |
| Group Three: >6 - 8 years | 191 | 15.8 |
| Group Four: >8 - 10 years | 202 | 16.7 |
| Group Five: >10 - 12 years | 170 | 14.1 |
| Group Six: >12 years | 208 | 17.2 |
| **Neuter status** | Intact | 529 | 43.8 |
| Neutered | 678 | 56.2 |
| **Sensory problems** | None | 980 | 81.2 |
| Vision and/or hearing | 227 | 18.8 |
| **Off-leash activity:** How long does your dog walk/run around outdoors without a leash on a typical day? | Less than 30 minutes | 164 | 13.6 |
| 30 minutes -1 hour | 269 | 22.3 |
| >1-3 hours | 367 | 30.4 |
| >3-7 hours | 165 | 13.7 |
| More than 7 hours | 242 | 20.0 |
| **Body condition score:** What body shape does your dog have? | Thin (BCS 1-2) | 203 | 16.8 |
| Normal (BCS 3) | 784 | 65.0 |
| Over-weight (BCS 4-5) | 220 | 18.2 |
| **Food:** What food are you currently feeding your dog for its main meal? | Dry food only | 267 | 22.1 |
| Tinned &/or dry food | 147 | 12.2 |
| Cooked food | 306 | 25.4 |
| Mixed | 294 | 24.4 |
| Raw meat | 193 | 16.0 |
| **Vitamins**: Do you give your dog vitamins or supplements? | Almost never | 328 | 27.2 |
| Rarely | 391 | 32.4 |
| Often | 244 | 20.2 |
| Regular (daily) | 244 | 20.2 |
| **Trauma:** Has the dog experienced a traumatic event, which could still have an effect on it? | No | 694 | 57.5 |
| Yes | 513 | 42.5 |
| **Health Problems:** What kind of health problems does your dog have? | None | 479 | 39.7 |
| Tooth problems only | 182 | 15.1 |
| Joint problems + tooth problems | 126 | 10.4 |
| Joint problems only | 246 | 20.4 |
| Other disorders | 174 | 14.4 |
| **Medication**: Is your dog currently taking any medication? | No | 1021 | 84.6 |
| Yes | 186 | 15.4 |
| **Owner age** | <29 years | 385 | 31.9 |
| 30-39 years | 343 | 28.4 |
| 40-49 years | 253 | 21.0 |
| >50 years | 226 | 18.7 |
| **Owner experience:** How would you evaluate your experience with dogs? | Dogs are my hobby/profession and/or I am a dog trainer/breeder | 307 | 25.4 |
| I have had a dog before | 639 | 52.9 |
| I had never had a dog before | 261 | 21.6 |
| **Other dogs in household:** How many other dogs do you have living in your household? (Not including this one). | None | 433 | 35.9 |
| One | 474 | 39.3 |
| Two or more | 300 | 24.9 |
| **People in household:** How many people are living in the household? | One person (myself) | 141 | 11.7 |
| Two people | 503 | 41.7 |
| Three people | 271 | 22.4 |
| Four or more people | 292 | 24.2 |
| **Child:** Do you have a child/children living in your household? | No | 919 | 76.1 |
| Yes | 288 | 23.9 |
| **Age of the dog when arrived:** The age of the dog when it arrived in the Owner’s household | less than 7 weeks | 265 | 22.0 |
| 7-12 weeks | 530 | 43.9 |
| 3-12 month | 198 | 16.4 |
| more than 1 year | 214 | 17.7 |
| **Get dog:** How did you get your dog? | I found it/got it from a shelter | 340 | 28.2 |
| It was born at my place/ bought it | 544 | 45.1 |
| I got it as a present | 323 | 26.8 |
| **Where dog is kept:** Where do you keep your dog? | House with a garden and/or in a non-fenced area | 149 | 12.3 |
| In a fenced garden | 384 | 31.8 |
| Urban/Suburban apartment | 674 | 55.8 |
| **Dog obedience tasks:** Which tasks can your dog reliably perform? (E.g., sit, lie down, come, fetch, stay, walk at heel, leave/drop it, watch me etc.). Open question. | maximum a task | 151 | 12.5 |
| 2 kinds of tasks | 169 | 14.0 |
| 3 kinds of tasks | 228 | 18.9 |
| more than 3 kind of tasks | 659 | 54.6 |
| **Play:** On an average day, how much time do you or other people spend together with your dog in different activities? (Play, walking, training) | less than 30 minutes | 122 | 10.1 |
| 30 minutes -1 hours | 378 | 31.3 |
| >1 -3 hours | 551 | 45.7 |
| more than 3 hours | 156 | 12.9 |
| **Commands:** How many commands can your dog execute reliably? | < 10 commands | 540 | 44.7 |
| 11 – 30 Commands | 535 | 44.3 |
| > 30 Commands | 132 | 10.9 |
| **Dog training activities:** How many activities are you currently doing with your dog? | One activity | 385 | 31.9 |
| 2 - 3 activities | 527 | 43.7 |
| 4 or more activities | 295 | 24.4 |
| **Time spent alone**: How much time does your dog spend alone on an average working day? | None | 169 | 14.0 |
| 1- 2 hours | 276 | 22.9 |
| 3- 8 hours | 594 | 49.2 |
| More than 8 hours | 168 | 13.9 |
| **Dog behavior changed:** Has your dog’s behavior changed over the last 3 months? | No | 910 | 75.4 |
| Yes | 297 | 24.6 |

### **Table 2**: Dog Personality Questionnaire (DPQ)

Here are a number of personality traits and behavioural descriptions that may or may not apply to your dog. Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement. You should rate your dog based on his or her general, overall behaviour: 1 Disagree strongly, 2 Disagree, 3 Neither agree nor disagree, 4 Agree, 5 Agree strongly.

|  |  |
| --- | --- |
| Item No. | Description |
| 1 | Dog is relaxed when greeting people |
| 2 | Dog behaves aggressively toward dogs |
| 3 | Dog is anxious |
| 4 | Dog is lethargic |
| 5 | When off leash, dog comes immediately when called |
| 6 | Dog is shy |
| 7 | Dog behaves aggressively towards unfamiliar people |
| 8 | Dog likes to chase squirrels, birds, or other small animals |
| 9 | Dog gets bored in play quickly |
| 10 | Dog is quick to sneak out through open doors, gates |
| 11 | Dog is confident |
| 12 | Dog is dominant over other dogs |
| 13 | Dog avoids other dogs |
| 14 | Dog works at tasks (eg, getting treats out of a Kong, shredding toys) until entirely finished |
| 15 | Dog is boisterous |
| 16 | Dog behaves fearfully during visits to the veterinarian |
| 17 | Dog enjoys playing with toys |
| 18 | Dog is friendly towards unfamiliar people |
| 19 | Dog is playful with other dogs |
| 20 | Dog seeks companionship from people |
| 21 | Dog behaves submissively (e, rolls over, avoids eye contact, licks lips) when greeting other dogs |
| 22 | Dog adapts easily to new situations and environments |
| 23 | Dog likes to chase bicycles, joggers, and skateboarders |
| 24 | Dog is curious |
| 25 | Dog behaves aggressively in response to perceived threats from people (eg, being cornered, having collar reached for) |
| 26 | Dog is aloof |
| 27 | Dog behaves fearfully towards unfamiliar people |
| 28 | Dog willingly shares toys with other dogs |
| 29 | Dog is slow to respond to corrections |
| 30 | Dog behaves aggressively during visits to the veterinarian |
| 31 | Dog seeks constant activity |
| 32 | Dog leaves food or objects alone when told to do so |
| 33 | Dog retrieves objects (eg, balls, toys, sticks) |
| 34 | Dog is friendly towards other dogs |
| 35 | Dog exhibits fearful behaviors when restrained |
| 36 | Dog aggressively guards coveted items (eg, stolen item, treats, food bowl) |
| 37 | Dog is affectionate |
| 38 | Dog ignores commands |
| 39 | Dog behaves aggressively towards cats |
| 40 | Dog shows aggression when nervous or fearful |
| 41 | Dog tends to be calm |
| 42 | Dog behaves fearfully towards other dogs |
| 43 | Dog is able to focus on a task in a distracting situation (eg, loud or busy places, around other dogs) |
| 44 | Dog behaves fearfully when groomed (eg, nails trimmed, brushed, bathed, ears cleaned) |
| 45 | Dog is assertive or pushy with other dogs (eg, if in a home with other dogs, when greeting) |

### **Table 3**: Dog Personality Questionnaire (DPQ) Factors, Facets, item numbers and reliability (Cronbach’s alpha of the five personality Factors) in the current study.

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## Correlations between the personality subscales

Correlations between the personality factor scores revealed two moderately significant relationships, shown in Table 3 (all sample sizes were 1078). The Aggression towards People factor correlated positively with the Fearfulness factor (r = 0.375, P < 0.001) and Aggression towards Animals (r = 0.488, P < 0.001). There were some other weak correlations, please see Table 4 for details.

### **Table 4: Correlations between the five factors of the DPQ.**

Moderate correlations are highlighted in orange and weak correlations in yellow. \*Correlation is significant at the 0.01 level (2-tailed). \* Correlation is significant at the 0.05 level (2-tailed).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | Aggression towards People | Activity/  Excitability | Responsiveness to Training | Aggression towards Animals |
| Fearfulness | r | .375\*\* | -.153\*\* | -.223\*\* | .106\* |
|  | Sig. (2-tailed) | .000 | .000 | .000 | .000 |
| Aggression towards People | r |  | -.082\* | -.203\*\* | .488\*\* |
| Sig. (2-tailed) |  | .007 | .000 | .000 |
| Activity/  Excitability | r |  |  | .217\*\* | .078\*\* |
| Sig. (2-tailed) |  |  | .000 | .011 |
| Responsiveness to Training | r |  |  |  | -.174\*\* |
| Sig. (2-tailed) |  |  |  | .000 |

## Main effect of age on the DPQ factors

### **Table 5: Results of the age group linear models for the three factors of the Dog Personality Questionnaire where a significant effect of age group was found.**

Significant predictors are highlighted in bold (p≤0.05). Adjusted p values are presented and Turkey contrasts for multiple comparisons of means was utilised to examine differences between the age groups.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Estimate** | **Std. Error** | **T** | | **F value** | | **P** | | **Multiple R**2 | **Adjusted R**2 |
| **Activity Excitability (lambda = 1.59)** | | |  | |  | |  | |
| Age group |  |  |  | | 51.340 | | **<0.001** | | 0.183 | 0.179 |
| Age group 2: Age group 1 | -0.556 | 0.115 | -4.826 | |  | | **<0.001** | |  |  |
| Age group 3: Age group 1 | -0.860 | 0.123 | -7.002 | |  | | **< 0.001** | |  |  |
| Age group 4: Age group 1 | -1.068 | 0.121 | -8.809 | |  | | **< 0.001** | |  |  |
| Age group 5: Age group 1 | -1.289 | 0.127 | -10.185 | |  | | **< 0.001** | |  |  |
| Age group 6: Age group 1 | -1.752 | 0.120 | -14.606 | |  | | **< 0.001** | |  |  |
| Age group 3: Age group 2 | -0.304 | 0.114 | -2.659 | |  | | 0.084 | |  |  |
| Age group 4: Age group 2 | -0.512 | 0.113 | -4.544 | |  | | **< 0.001** | |  |  |
| Age group 5: Age group 2 | -0.733 | 0.118 | -6.191 | |  | | **< 0.001** | |  |  |
| Age group 6: Age group 2 | -1.196 | 0.111 | -10.745 | |  | | **< 0.001** | |  |  |
| Age group 4: Age group 3 | -0.208 | 0.121 | -1.725 | |  | | 0.515 | |  |  |
| Age group 5: Age group 3 | -0.429 | 0.126 | -3.406 | |  | | **0.009** | |  |  |
| Age group 6: Age group 3 | -0.892 | 0.119 | -7.479 | |  | | **< 0.001** | |  |  |
| Age group 5: Age group 4 | -0.221 | 0.124 | -1.776 | |  | | 0.481 | |  |  |
| Age group 6: Age group 4 | -0.684 | 0.118 | -5.815 | |  | | **< 0.001** | |  |  |
| Age group 6: Age group 5 | -0.463 | 0.123 | -3.763 | |  | | **0.003** | |  |  |
| **Responsiveness to training (lambda = 1.31)** | | |  |  | |  | |  | |
| Age group |  |  |  | | 10.220 | | **<0.001** | | 0.042 | 0.038 |
| Age group 2: Age group 1 | 0.114 | 0.116 | 0.983 | |  | | 0.923 | |  |  |
| Age group 3: Age group 1 | 0.072 | 0.123 | 0.584 | |  | | 0.992 | |  |  |
| Age group 4: Age group 1 | 0.047 | 0.121 | 0.390 | |  | | 0.999 | |  |  |
| Age group 5: Age group 1 | -0.219 | 0.127 | -1.726 | |  | | 0.514 | |  |  |
| Age group 6: Age group 1 | -0.573 | 0.120 | -4.766 | |  | | **<0.001** | |  |  |
| Age group 3: Age group 2 | -0.042 | 0.114 | -0.368 | |  | | 0.999 | |  |  |
| Age group 4: Age group 2 | -0.067 | 0.112 | -0.593 | |  | | 0.992 | |  |  |
| Age group 5: Age group 2 | -0.332 | 0.118 | -2.806 | |  | | 0.057 | |  |  |
| Age group 6: Age group 2 | -0.687 | 0.112 | -6.158 | |  | | **<0.001** | |  |  |
| Age group 4: Age group 3 | -0.024 | 0.120 | -0.205 | |  | | 1 | |  |  |
| Age group 5: Age group 3 | -0.290 | 0.125 | -2.315 | |  | | 0.188 | |  |  |
| Age group 6: Age group 3 | -0.645 | 0.119 | -5.424 | |  | | **<0.001** | |  |  |
| Age group 5: Age group 4 | -0.266 | 0.124 | -2.150 | |  | | 0.262 | |  |  |
| Age group 6: Age group 4 | -0.621 | 0.117 | -5.302 | |  | | **<0.001** | |  |  |
| Age group 6: Age group 5 | -0.355 | 0.123 | -2.884 | |  | | **0.046** | |  |  |
| **Aggressiveness to animals (lambda = 0.46)** | | |  | |  | |  | |  |  |
| Age group |  |  |  | | 4.628 | | **<0.001** | | 0.019 | 0.015 |
| Age group 2: Age group 1 | 0.017 | 0.044 | 0.376 | |  | | 0.999 | |  |  |
| Age group 3: Age group 1 | 0.136 | 0.047 | 2.883 | |  | | **0.046** | |  |  |
| Age group 4: Age group 1 | 0.139 | 0.046 | 2.993 | |  | | **0.033** | |  |  |
| Age group 5: Age group 1 | 0.040 | 0.049 | 0.827 | |  | | 0.962 | |  |  |
| Age group 6: Age group 1 | -0.020 | 0.046 | -0.439 | |  | | 0.998 | |  |  |
| Age group 3: Age group 2 | 0.120 | 0.044 | 2.728 | |  | | 0.070 | |  |  |
| Age group 4: Age group 2 | 0.122 | 0.043 | 2.849 | |  | | 0.051 | |  |  |
| Age group 5: Age group 2 | 0.023 | 0.045 | 0.519 | |  | | 0.995 | |  |  |
| Age group 6: Age group 2 | -0.037 | 0.043 | -0.865 | |  | | 0.955 | |  |  |
| Age group 4: Age group 3 | 0.003 | 0.046 | 0.060 | |  | | 1.000 | |  |  |
| Age group 5: Age group 3 | -0.096 | 0.048 | -2.000 | |  | | 0.342 | |  |  |
| Age group 6: Age group 3 | -0.157 | 0.046 | -3.421 | |  | | **0.008** | |  |  |
| Age group 5: Age group 4 | -0.099 | 0.047 | -2.093 | |  | | 0.291 | |  |  |
| Age group 6: Age group 4 | -0.159 | 0.045 | -3.548 | |  | | **0.005** | |  |  |
| Age group 6: Age group 5 | -0.060 | 0.047 | -1.284 | |  | | 0.793 | |  |  |

## Main effect of age on the DPQ facets

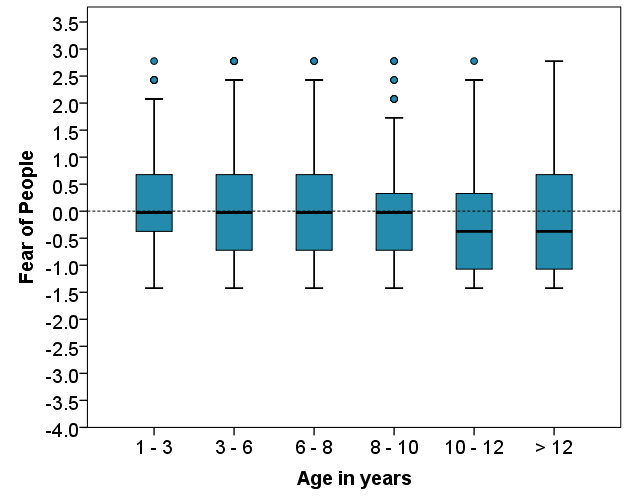
Results of the Kruskal Wallis Tests showed significant age effects in the following 11 facets (out of 15): Fear of people, Non-social fear, Excitability, Playfulness, Active engagement, Companionability, Trainability, Controllability, Aggression towards animals, Prey drive and Dominance over dogs (all p values < 0.003; Figure 1). Fear of people peaked in dogs aged three to six years and was lowest in dogs aged over ten years. Non-social fear increased with age, with dogs aged over 12 years showing the highest levels, and dogs aged under three years the lowest levels. Excitability, Playfulness, and Active engagement all showed a significant linear decrease with age (highest scores in dogs aged one to three, and the lowest in dogs aged over 12 years). Trainability scores remained high until declining from ten years onwards. Controllability showed a quadratic distribution, peaking in three to six year olds, and was lowest in dogs aged over 12 years. Aggression towards dogs was lowest in the youngest age group, and highest in the oldest. Conversely, prey drive was highest in the youngest age group and lowest in the oldest. Finally, Dominance over dogs showed a quadratic distribution and peaked in dogs aged 8 to 10.

### *Figure 1 a-k:* Median Z score and interquartile range of the Dog Personality Questionnaire facets

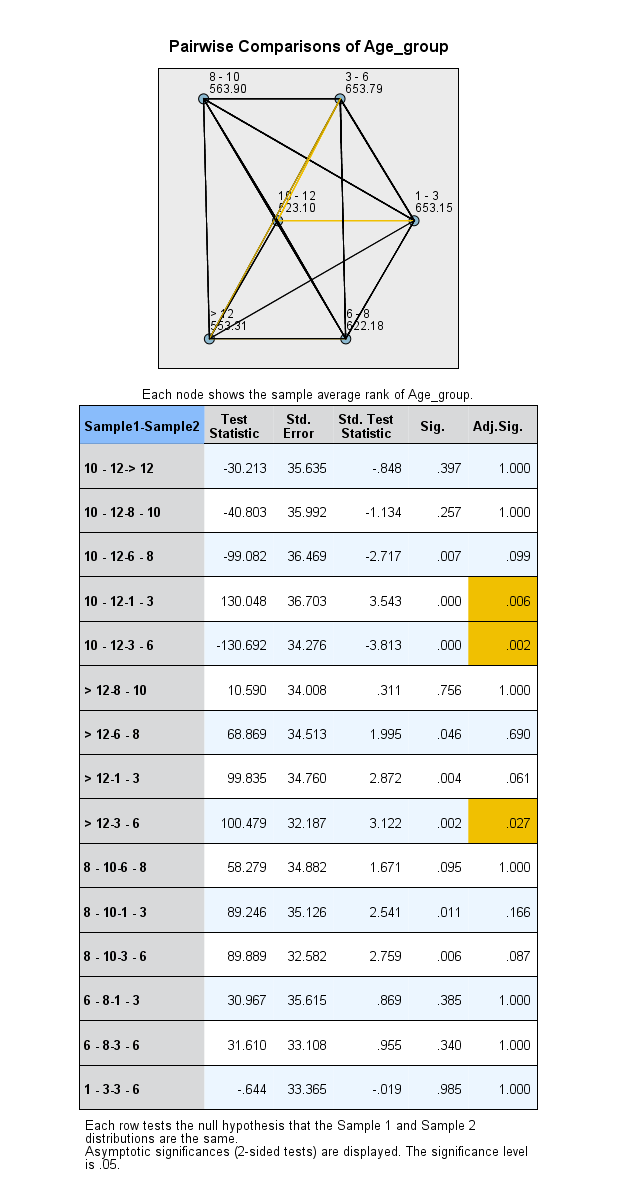
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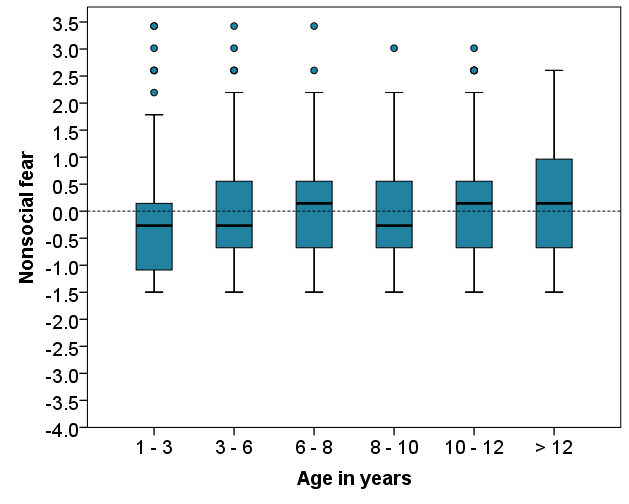
a)

a) Fear of people, b) Non-social fear, c) Excitability, d) Playfulness, e) Active engagement, f) Companionability, g) Trainability, h) Companionability, i) Aggression towards animals, j) Prey drive, and k) Dominance over dogs, in the six different dog age groups. For statistical differences, see text. Underneath each graph a table with a pairwise comparison of each age group is presented, along with test statistic, standard error, significance level, and adjusted significance level for multiple comparisons.

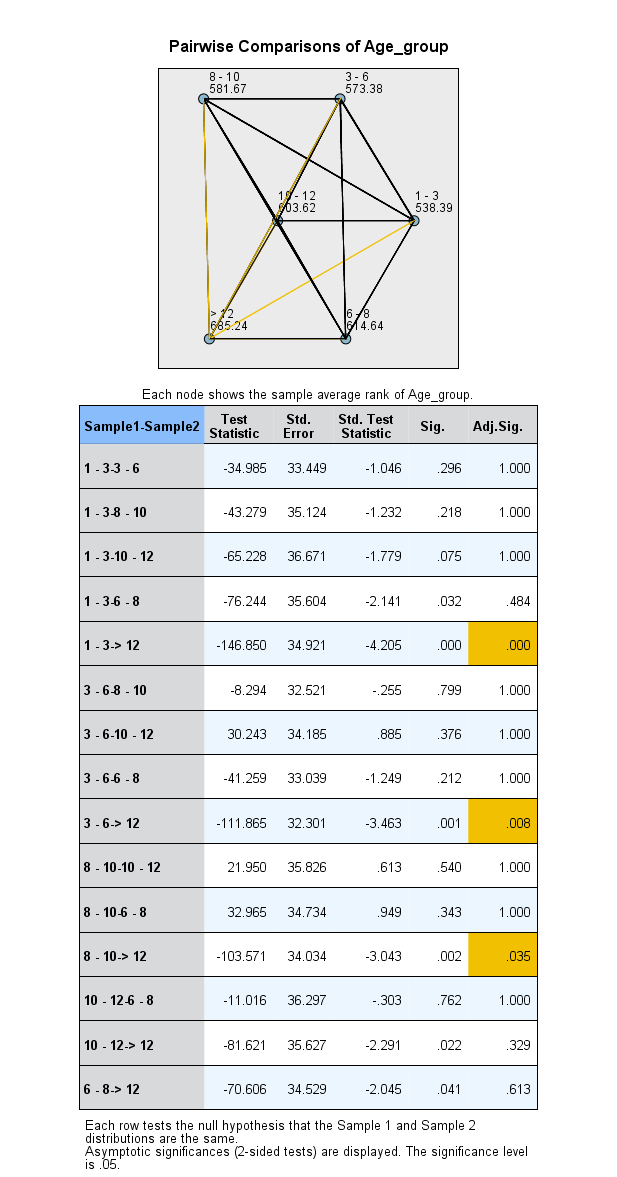


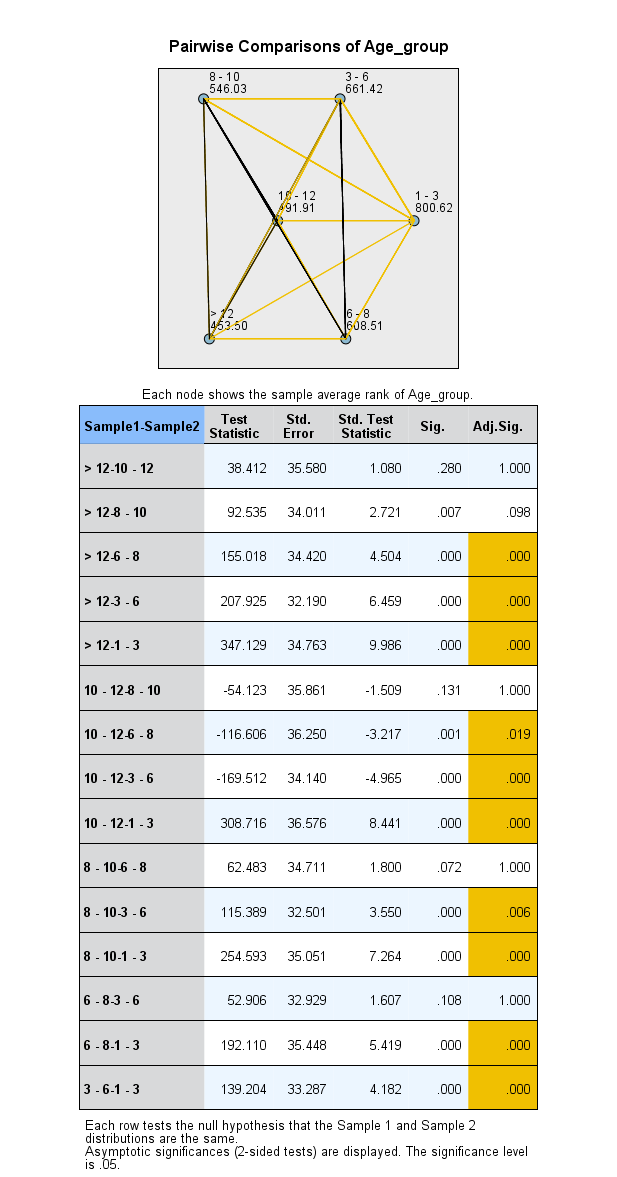
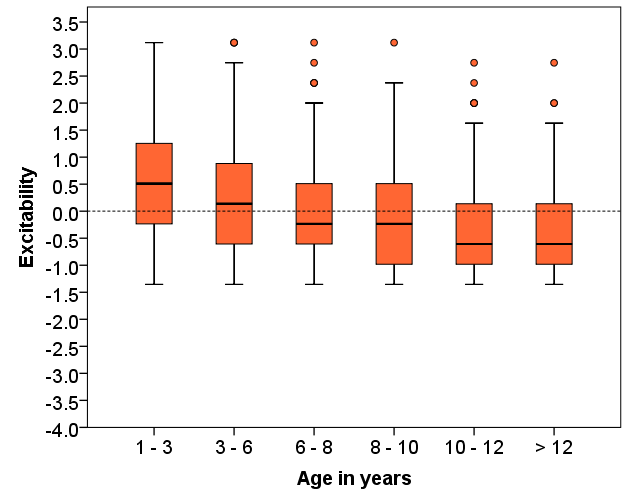
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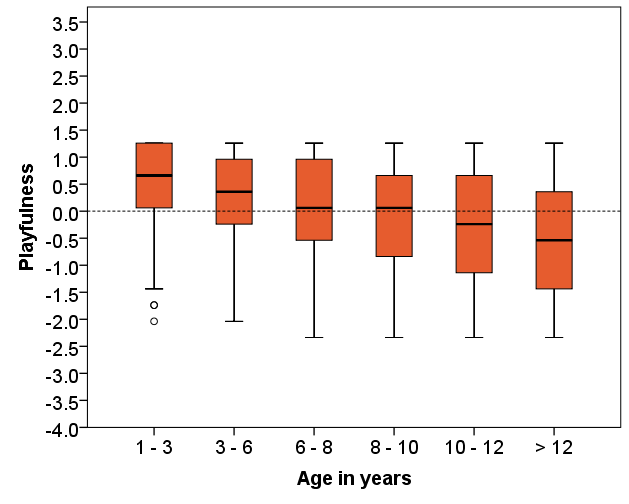


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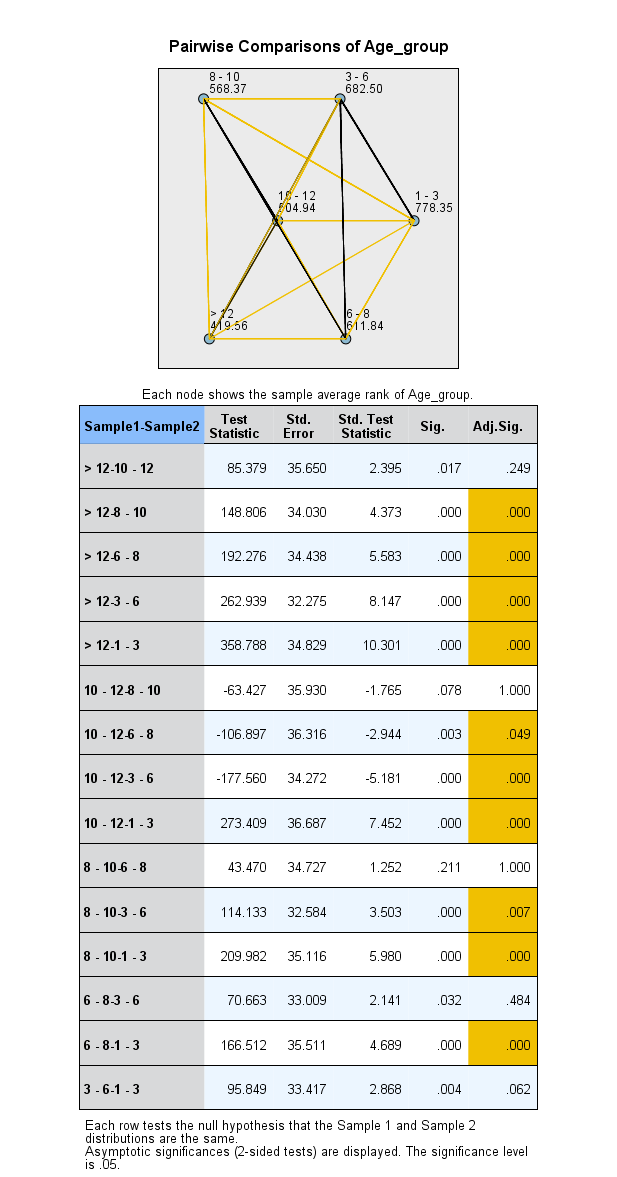


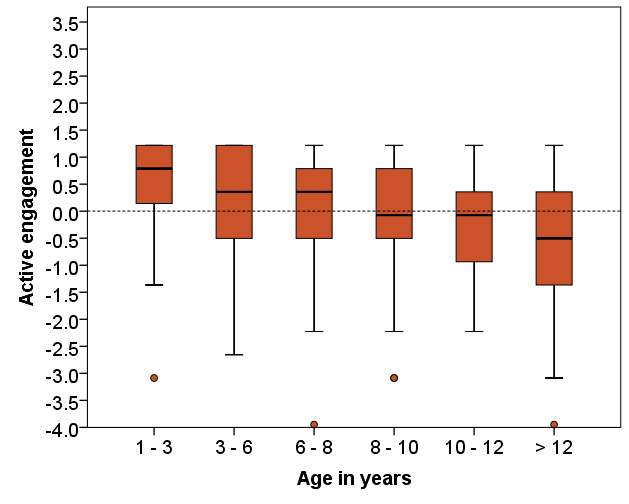


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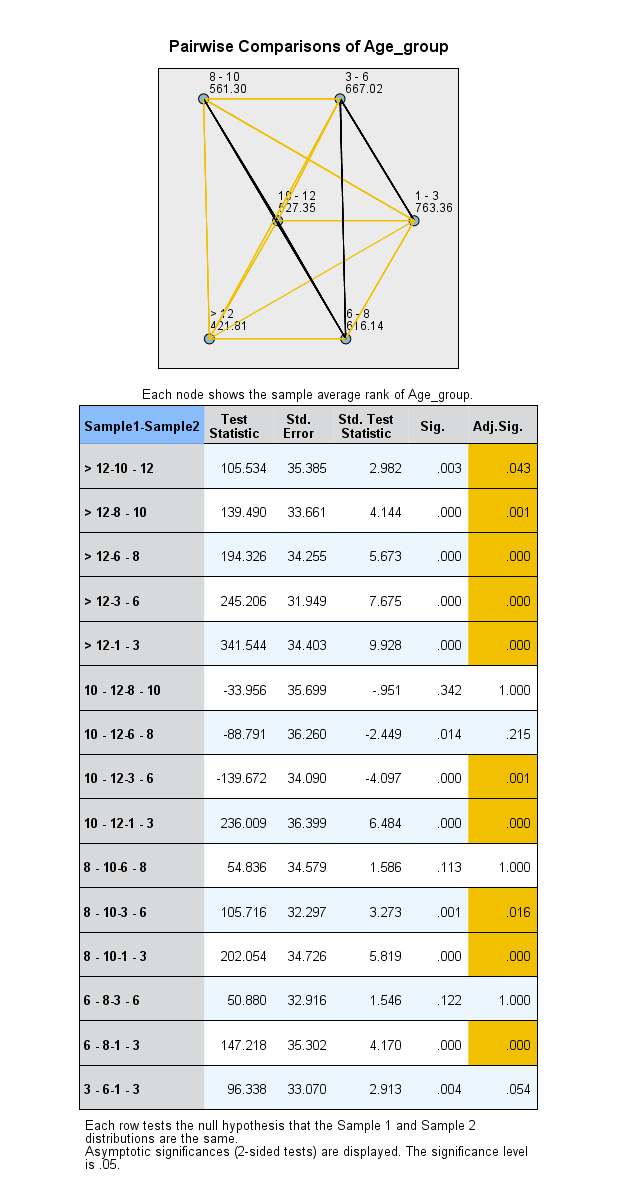


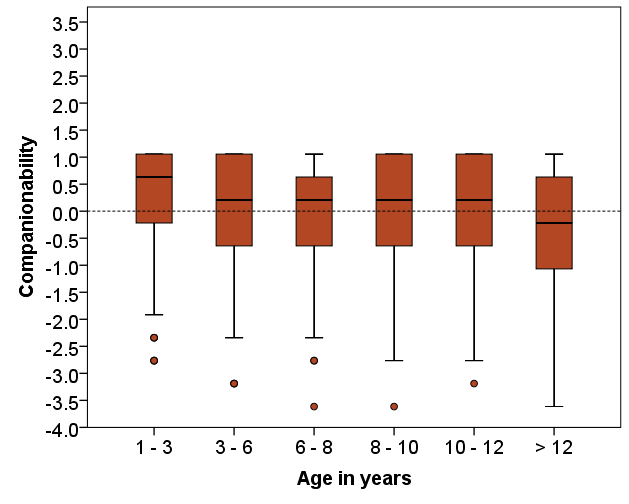
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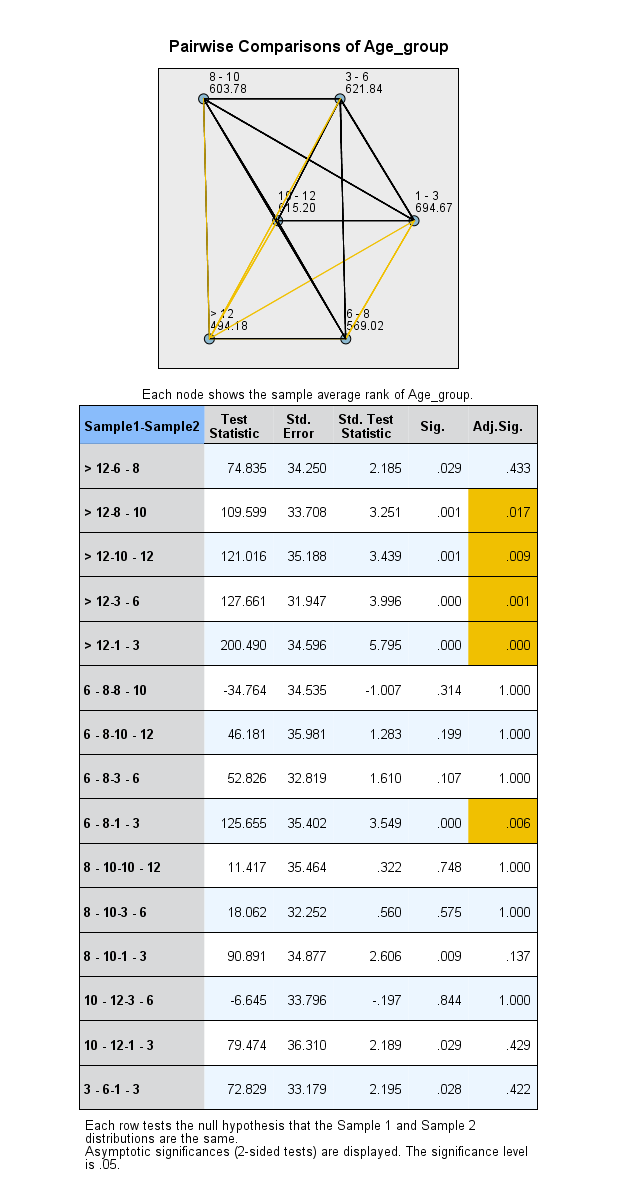


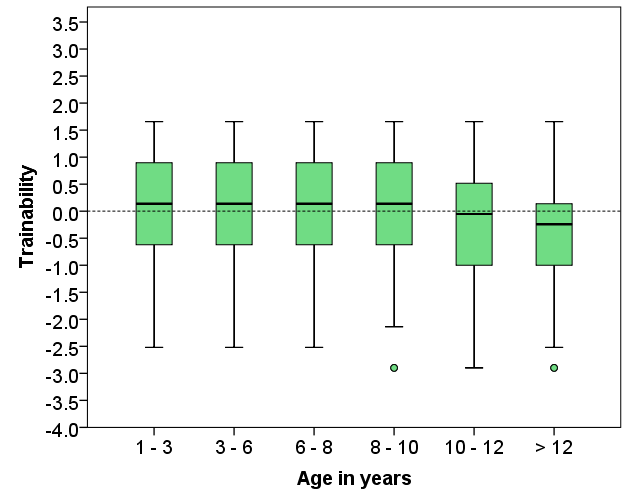
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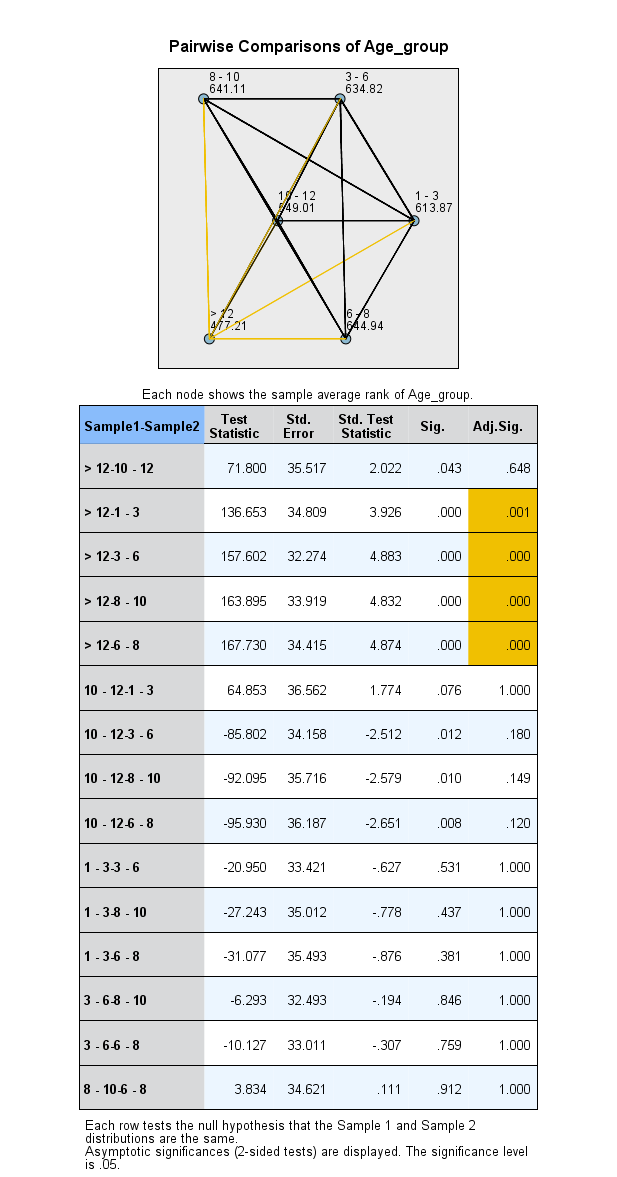


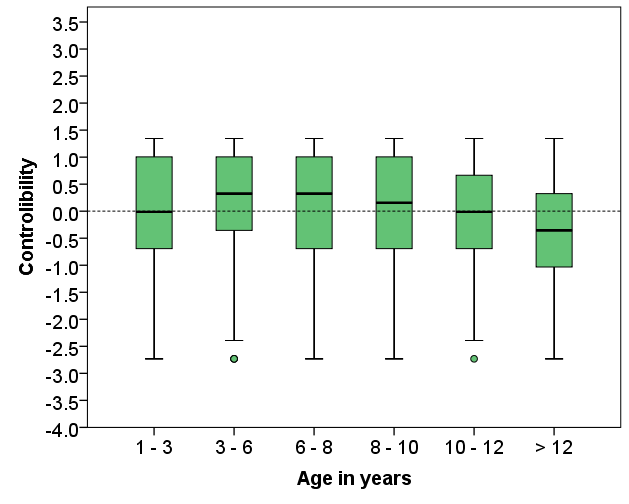
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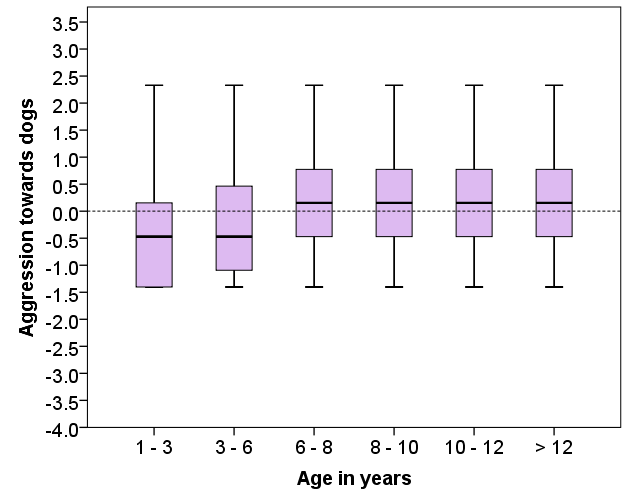
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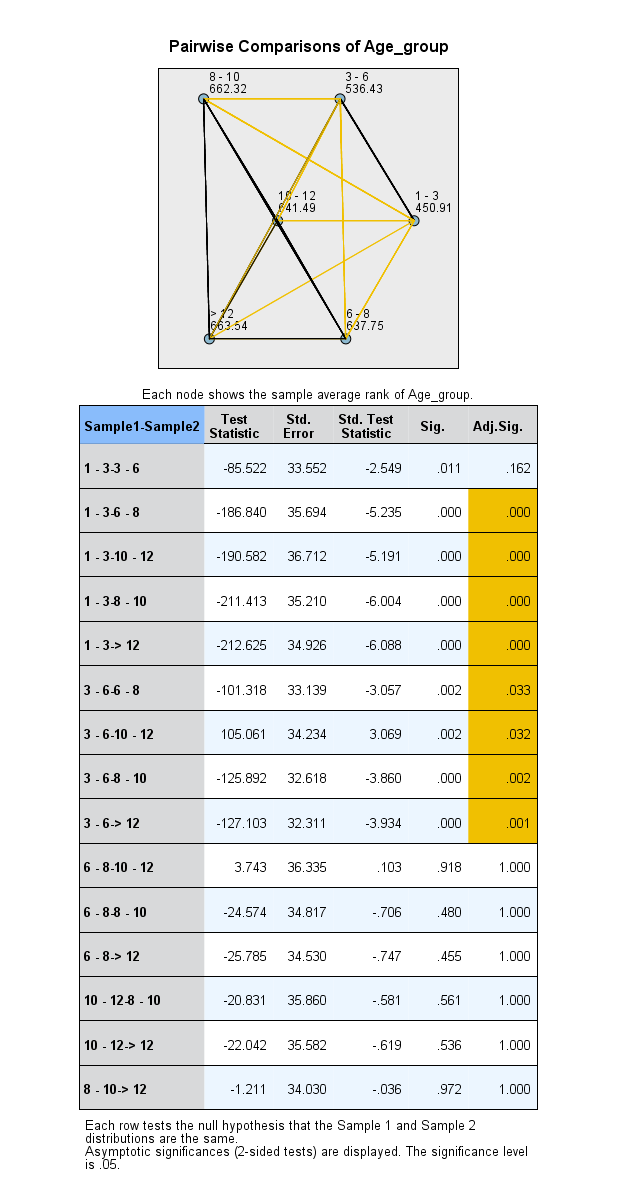


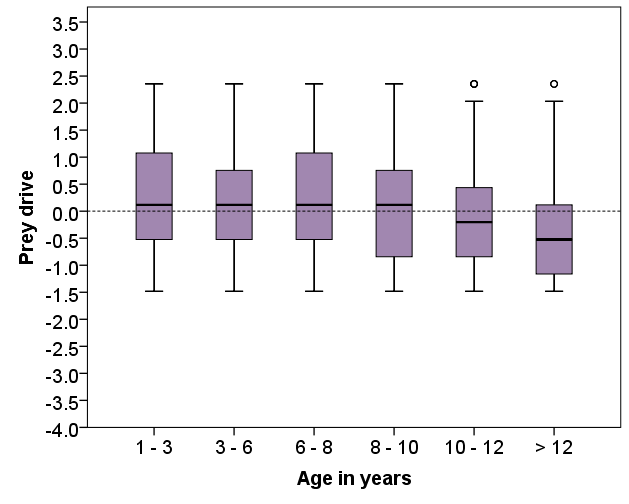
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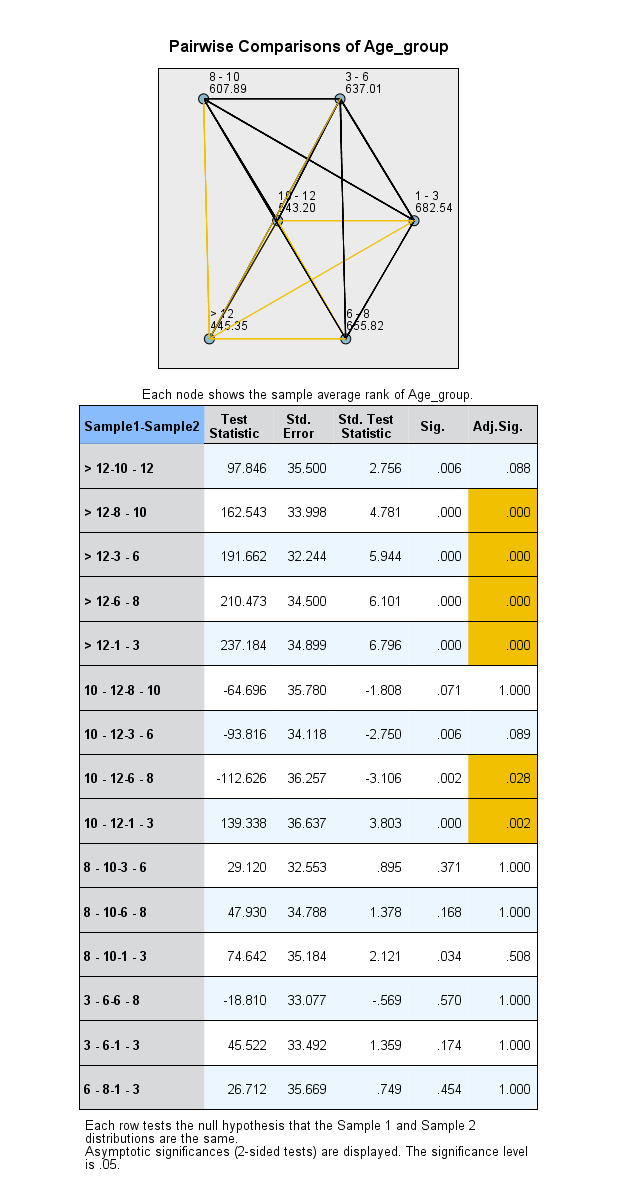


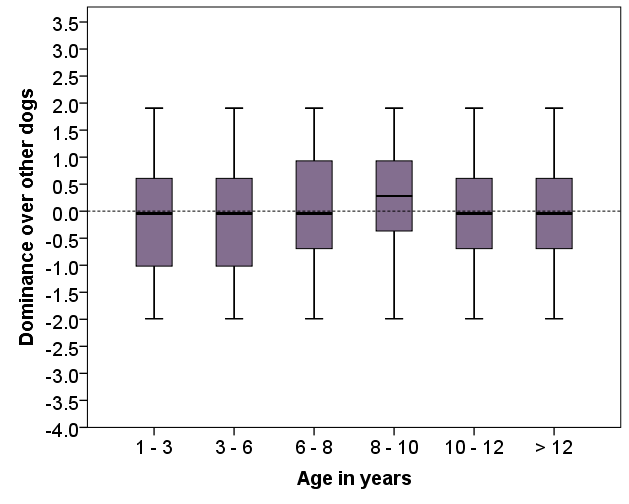
#### i)



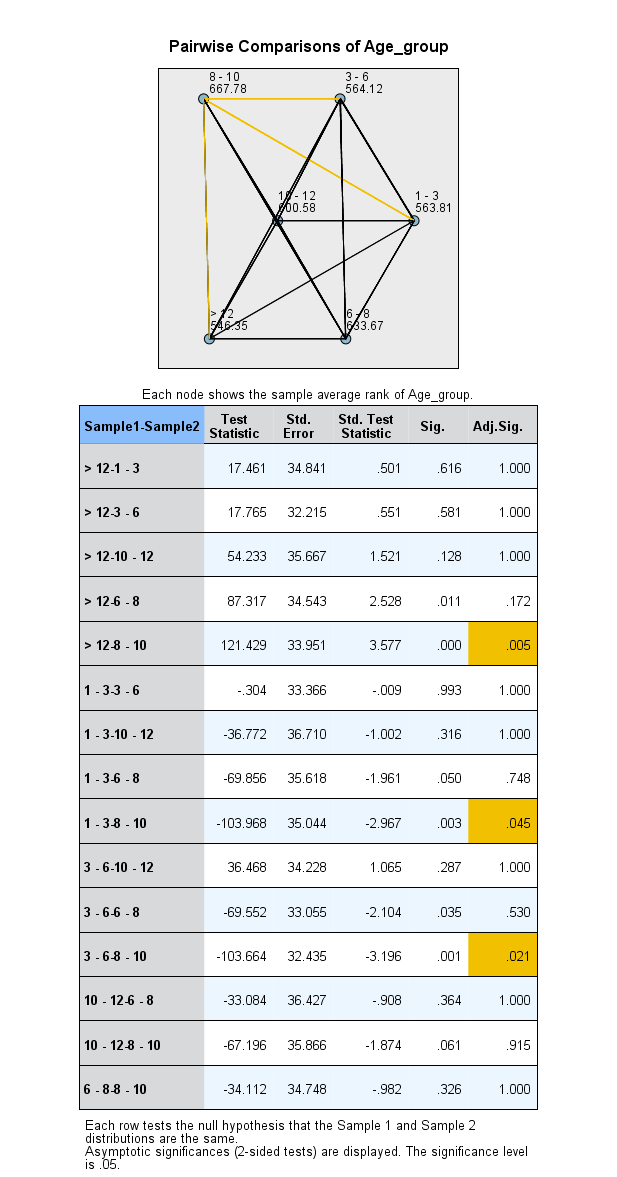


#### j)





#### k)



## Linear models: Main effects of the demographic variables

### Table 6: General linear models showing the direction of the effects and the significance level of the terms in the five factors of the DPQ.

Significant group differences are highlighted in bold (p≤0.05).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Response variable** | | | | **Category** | **Reference category** | | **Estimate** | | **SE** | | **t** | | **P** | |
| **Fearfulness (lambda = 0.38)** | | | | |  | |  | |  | |  | |  | |
| Weight | | | | |  | | -0.007 | | 0.001 | | -5.391 | | **<0.001** | |
| Breed | | | Pure breed | | Mixed breed | | -0.118 | | 0.029 | | -4.070 | | **<0.001** | |
| Sex | | | Male | | Female | | -0.068 | | 0.022 | | -3.002 | | **0.003** | |
| Trauma | | | Yes | | No | | 0.155 | | 0.024 | | 6.382 | | **<0.001** | |
| Dog obedience tasks | | | | 2 kinds of tasks | maximum a task | | -0.043 | | 0.042 | | -1.019 | | 0.308 | |
|  | | | | 3 kinds of tasks | maximum a task | | -0.097 | | 0.040 | | -2.390 | | **0.017** | |
|  | | | | ≥ 4 kinds of tasks | maximum a task | | -0.150 | | 0.039 | | -3.862 | | **<0.001** | |
| Dog training activities | | | | 2 - 3 activities | One activity | | 0.033 | | 0.030 | | 1.112 | | 0.267 | |
|  | | | | 4 or more activities | One activity | | -0.105 | | 0.034 | | -3.061 | | **0.002** | |
| **Aggression towards people (lambda = -0.66)** | | | | | | |  | |  | |  | |  | |
| Breed: Pure breed | | | | Pure breed | Mixed breed | | -0.065 | 0.021 | | -3.180 | | **0.002** | |
| Sex: Male | | | | Male | Female | | 0.061 | 0.016 | | 3.793 | | **<0.001** | |
| Trauma | | | | Yes | No | | 0.081 | 0.017 | | 4.706 | | **<0.001** | |
| Dog obedience tasks | | | | 2 kinds of tasks | maximum a task | | -0.002 | | 0.030 | | -0.082 | | 0.934 | |
|  |  | | | 3 kinds of tasks | maximum a task | | -0.118 | | 0.029 | | -4.072 | | **<0.001** | |
|  |  | | | ≥ 4 kinds of tasks | maximum a task | | -0.126 | | 0.028 | | -4.530 | | **<0.001** | |
| **Activity Excitability (lambda = 1.51)** | | | | |  | |  | |  | |  | |  | |
| Age group | | | >3 - 6 years | | 1 - 3 years | | -0.394 | | 0.101 | | -3.884 | | **<0.001** | |
|  | | | >6 - 8 years | | 1 - 3 years | | -0.661 | | 0.109 | | -6.058 | | **<0.001** | |
|  | | | >8 - 10 years | | 1 - 3 years | | -0.764 | | 0.113 | | -6.752 | | **<0.001** | |
|  | | | >10 - 12 years | | 1 - 3 years | | -0.918 | | 0.120 | | -7.626 | | **<0.001** | |
|  | | | >12 years | | 1 - 3 years | | -1.090 | | 0.129 | | -8.473 | | **<0.001** | |
| Sensory problems | | Yes | | | No | | -0.240 | | 0.094 | | -2.555 | | **0.011** | |
| Body condition score | | | Normal | | Thin | | -0.003 | | 0.061 | | -0.038 | | 0.999 | |
|  | | | Overweight | | Thin | | -0.264 | | 0.104 | | -2.535 | | **0.030** | |
|  | | | Overweight | | Normal | | -0.261 | | 0.081 | | -3.240 | | **0.004** | |
| Age of dog when arrived | | | | 7-12 weeks | <7 weeks | | -0.208 | | 0.078 | | -2.677 | | **0.008** | |
|  |  | | | 3-12 months | <7 weeks | | -0.474 | | 0.099 | | -4.781 | | **<0.001** | |
|  |  | | | >1 year | <7 weeks | | -0.673 | | 0.109 | | -6.172 | | **<0.001** | |
| Get dog |  | | | It was born at my place/ I bought it | I found it/got it from a shelter | | -0.330 | | 0.105 | | -3.127 | | **0.002** | |
|  |  | | | I got it as a present | I found it/got it from a shelter | | -0.173 | | 0.092 | | -1.890 | | 0.059 | |
| Dog obedience tasks | | | | 2 kinds of tasks | maximum a task | | 0.302 | | 0.114 | | 2.649 | | **0.008** | |
|  |  | | | 3 kinds of tasks | maximum a task | | 0.321 | | 0.110 | | 2.918 | | **0.004** | |
|  |  | | | ≥ 4 kinds of tasks | maximum a task | | 0.617 | | 0.105 | | 5.888 | | **< 0.001** | |
| **Responsiveness to training (lambda = 1.31)** | | | | | | |  | |  | |  | |  | |  |  |
| Weight | |  | | | |  | 0.009 | | 0.003 | | 2.653 | | **0.008** | |  |  |
| Sex | | Male | | | | Female | -0.181 | | 0.056 | | -3.215 | | **0.001** | |  |  |
| Off-leash activity | | 30 minutes -1 hour | | | | < 30 minutes | 0.135 | | 0.093 | | 1.440 | | 0.150 | |  |  |
|  | | >1-3 hours | | | | < 30 minutes | 0.316 | | 0.091 | | 3.482 | | **<0.001** | |  |  |
|  | | >3-7 hours | | | | < 30 minutes | 0.315 | | 0.107 | | 2.936 | | **0.003** | |  |  |
|  | | more than 7 hours | | | | < 30 minutes | 0.220 | | 0.106 | | 2.087 | | **0.037** | |  |  |
| Dog obedience tasks | | 2 kinds of tasks | | | | maximum a task | 0.251 | | 0.105 | | 2.396 | | **0.017** | |  |  |
|  | | 3 kinds of tasks | | | | maximum a task | 0.665 | | 0.100 | | 6.626 | | **<0.001** | |  |  |
|  | | ≥ 4 kinds of tasks | | | | maximum a task | 1.326 | | 0.096 | | 13.780 | | **<0.001** | |  |  |
| Play | | 30 minutes -1 hours | | | | < 30 minutes | 0.182 | | 0.099 | | 1.840 | | 0.066 | |  |  |
|  | | >1 -3 hours | | | | < 30 minutes | 0.287 | | 0.100 | | 2.854 | | **0.004** | |  |  |
|  | | more than 3 hours | | | | < 30 minutes | 0.402 | | 0.121 | | 3.316 | | **< 0.001** | |  |  |
| Commands | | 11 - 30 | | | | < 10 | 0.308 | | 0.068 | | 4.564 | | **< 0.001** | |  |  |
|  | | >31 | | | | < 10 | 0.657 | | 0.108 | | 6.058 | | **< 0.001** | |  |  |
| **Aggressiveness towards animals (lambda = 0.46)** | | | | | | |  | |  | |  | |  | |
| Age group |  | | | >3 - 6 years | 1 - 3 years | | 0.020 | | 0.045 | | 0.449 | | 0.653 | |
|  |  | | | >6 - 8 years | 1 - 3 years | | 0.126 | | 0.049 | | 2.586 | | **0.010** | |
|  |  | | | >8 - 10 years | 1 - 3 years | | 0.119 | | 0.050 | | 2.392 | | **0.017** | |
|  |  | | | >10 - 12 years | 1 - 3 years | | 0.026 | | 0.053 | | 0.484 | | 0.628 | |
|  |  | | | >12 years | 1 - 3 years | | -0.057 | | 0.057 | | -0.985 | | 0.325 | |
| Food |  | | | Tinned &/or dry food | Dry food only | | -0.105 | | 0.047 | | -2.221 | | 0.171 | |
|  |  | | | Cooked food | Dry food only | | 0.025 | | 0.039 | | 0.662 | | 0.964 | |
|  |  | | | Mixed | Dry food only | | 0.062 | | 0.040 | | 1.523 | | 0.545 | |
|  |  | | | Raw meat | Dry food only | | 0.038 | | 0.043 | | 0.890 | | 0.900 | |
|  |  | | | Cooked food | Tinned &/or dry food | | 0.130 | | 0.045 | | 2.867 | | **0.034** | |
|  |  | | | Mixed | Tinned &/or dry food | | 0.166 | | 0.047 | | 3.540 | | **0.004** | |
|  |  | | | Raw meat | Tinned &/or dry food | | 0.143 | | 0.050 | | 2.843 | | **0.036** | |
|  |  | | | Mixed | Cooked food | | 0.036 | | 0.039 | | 0.933 | | 0.883 | |
|  |  | | | Raw meat | Cooked food | | 0.013 | | 0.042 | | 0.302 | | 0.998 | |
|  |  | | | Raw meat | Mixed | | -0.023 | | 0.043 | | -0.544 | | 0.982 | |
| Trauma |  | | | Yes | No | | 0.085 | | 0.029 | | 2.916 | | **0.004** | |
| Dog obedience tasks | | | | 2 kinds of tasks | maximum a task | | 0.059 | | 0.051 | | 1.165 | | 0.244 | |
|  | | | | 3 kinds of tasks | maximum a task | | -0.053 | | 0.049 | | -1.096 | | 0.273 | |
|  |  | | | ≥ 4 kinds of tasks | maximum a task | | -0.135 | | 0.047 | | -2.891 | | **0.004** | |

## Dog Personality Factor Linear Models R code

### DPQFAC1 – Fearfulness

#### Age only

> lm<-lm(bcPower(DPQFAC1new,0.38)~(age), data = data, na.action = na.omit)

> etasq(lm, anova = TRUE, type=3)

Anova Table (Type III tests)

Response: bcPower(DPQFAC1new, 0.38)

Partial eta^2 Sum Sq Df F value Pr(>F)

(Intercept) 0.45090 154.92 1 955.8315 <2e-16 \*\*\*

age 0.00574 1.09 5 1.3447 0.2429

Residuals 188.66 1164

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm)

Call:

lm(formula = bcPower(DPQFAC1new, 0.38) ~ (age), data = data,

na.action = na.omit)

Residuals:

Min 1Q Median 3Q Max

-0.9387 -0.2897 0.0142 0.2832 1.0270

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.935562 0.030261 30.917 <2e-16 \*\*\*

ageGroup2 0.057580 0.039715 1.450 0.147

ageGroup3 0.049773 0.042330 1.176 0.240

ageGroup4 0.003163 0.041645 0.076 0.939

ageGroup5 -0.030145 0.043705 -0.690 0.490

ageGroup6 0.035709 0.041450 0.862 0.389

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.4026 on 1164 degrees of freedom

(37 observations deleted due to missingness)

Multiple R-squared: 0.005743, Adjusted R-squared: 0.001472

F-statistic: 1.345 on 5 and 1164 DF, p-value: 0.2429

> Residuals <- residuals (lm)

> qqnorm(Residuals)

> shapiro.test (Residuals)

Shapiro-Wilk normality test

data: Residuals

W = 0.99363, p-value = 6.623e-05

#### Full Model

> lm<-lm(bcPower(DPQFAC1new,0.38)~(age+sensory+height+weight+breed+sex+neuter+offleash\_activity+BCS+food+Add\_vitamins+trauma+Health\_prob+medication+Owner\_age+Owner\_dog\_exp+How\_many\_dogs\_in\_house+How\_many\_people+Child+Age\_of\_dog\_when\_arrived+get\_dog+Where\_dog\_is\_kept+dog\_obedience+play+commands+training+Time\_dog\_spend\_alone+dog\_beh\_changed\_3month), data = data, na.action = na.omit)

> etasq(lm, anova = TRUE, type=3)

Anova Table (Type III tests)

Response: bcPower(DPQFAC1new, 0.38)

Partial eta^2 Sum Sq Df F value Pr(>F)

(Intercept) 0.097047 15.543 1 118.9769 < 2.2e-16 \*\*\*

Age 0.011822 1.730 5 2.6487 0.0217269 \*

sensory 0.001563 0.226 1 1.7332 0.1882778

height 0.000200 0.029 1 0.2211 0.6383243

weight 0.024473 3.628 1 27.7712 1.640e-07 \*\*\*

breed 0.013463 1.973 1 15.1066 0.0001076 \*\*\*

sex 0.009584 1.399 1 10.7122 0.0010972 \*\*

neuter 0.002912 0.422 1 3.2333 0.0724270 .

offleash\_activity 0.004839 0.703 4 1.3457 0.2509659

BCS 0.000839 0.121 2 0.4646 0.6285174

food 0.002624 0.380 4 0.7281 0.5727854

Add\_vitamins 0.002431 0.352 3 0.8991 0.4410215

trauma 0.034761 5.208 1 39.8665 3.929e-10 \*\*\*

Health\_prob 0.009200 1.343 4 2.5696 0.0365694 \*

medication 0.000033 0.005 1 0.0361 0.8493583

Owner\_age 0.001977 0.287 3 0.7311 0.5335260

Owner\_dog\_exp 0.001530 0.222 2 0.8481 0.4285127

How\_many\_dogs\_in\_house 0.001564 0.227 2 0.8671 0.4204684

How\_many\_people 0.001308 0.189 3 0.4832 0.6939953

Child 0.000039 0.006 1 0.0432 0.8354138

Age\_of\_dog\_when\_arrived 0.002636 0.382 3 0.9752 0.4036565

get\_dog 0.001692 0.245 2 0.9381 0.3916660

Where\_dog\_is\_kept 0.002095 0.304 2 1.1619 0.3132760

dog\_obedience 0.016579 2.438 3 6.2209 0.0003443 \*\*\*

play 0.000416 0.060 3 0.1537 0.9273334

commands 0.000680 0.098 2 0.3768 0.6861150

training 0.011852 1.735 2 6.6390 0.0013610 \*\*

Time\_dog\_spend\_alone 0.004837 0.703 3 1.7934 0.1466462

dog\_beh\_changed\_3month 0.003987 0.579 1 4.4315 0.0355062 \*

Residuals 144.616 1107

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm)

Call:

lm(formula = bcPower(DPQFAC1new, 0.38) ~ (age3 + sensory2 + height +

weight + breed + sex + neuter2 + offleash\_activity + shape +

food + Add\_vitamins + trauma + Health\_prob + medication +

Owner\_age + Owner\_dog\_exp + How\_many\_dogs\_in\_house + How\_many\_people +

Child + Age\_of\_dog\_when\_arrived + get\_dog + Where\_dog\_is\_kept2 +

dog\_jobs + play + commands + training + Time\_dog\_spend\_alone +

dog\_beh\_changed\_3month), data = new\_cog\_no\_missing3, na.action = na.omit)

Residuals:

Min 1Q Median 3Q Max

-1.03946 -0.26056 0.00112 0.25700 1.28626

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 1.195e+00 1.095e-01 10.908 < 2e-16 \*\*\*

ageGroup2 2.647e-02 3.774e-02 0.701 0.483271

ageGroup3 1.203e-02 4.055e-02 0.297 0.766829

ageGroup4 -6.371e-02 4.206e-02 -1.515 0.130090

ageGroup5 -9.928e-02 4.477e-02 -2.218 0.026781 \*

ageGroup6 -6.170e-02 4.820e-02 -1.280 0.200788

sensory\_probPresent -4.617e-02 3.507e-02 -1.317 0.188278

height 5.067e-04 1.078e-03 0.470 0.638324

weight -7.062e-03 1.340e-03 -5.270 1.64e-07 \*\*\*

breedPure -1.127e-01 2.900e-02 -3.887 0.000108 \*\*\*

sexMale -7.489e-02 2.288e-02 -3.273 0.001097 \*\*

neuterNeutered 4.414e-02 2.454e-02 1.798 0.072427 .

offleash\_activity30m-1h 1.329e-03 3.798e-02 0.035 0.972096

offleash\_activity1-3h -1.003e-02 3.665e-02 -0.274 0.784419

offleash\_activity2-7 -2.557e-02 4.347e-02 -0.588 0.556589

offleash\_activity>7 -7.787e-02 4.263e-02 -1.827 0.068042 .

BCSNormal -2.216e-02 3.034e-02 -0.730 0.465449

BCSOverweight 3.593e-05 3.914e-02 0.001 0.999268

foodTinned dry 2.859e-02 4.010e-02 0.713 0.476011

foodCooked -2.089e-03 3.241e-02 -0.064 0.948623

foodMixed 1.677e-02 3.398e-02 0.493 0.621865

foodRaw -3.566e-02 3.596e-02 -0.992 0.321516

Add\_vitaminsRarely 1.818e-02 2.869e-02 0.634 0.526426

Add\_vitaminsOften -2.398e-02 3.289e-02 -0.729 0.466234

Add\_vitaminsDaily 2.602e-02 3.439e-02 0.757 0.449507

traumaYes 1.545e-01 2.447e-02 6.314 3.93e-10 \*\*\*

Health\_probTooth only 4.517e-02 3.635e-02 1.243 0.214259

Health\_probJoint & Tooth 8.110e-02 4.323e-02 1.876 0.060895 .

Health\_probJoint only 2.791e-04 3.318e-02 0.008 0.993291

Health\_probOther 9.189e-02 3.590e-02 2.560 0.010611 \*

medicationYes 6.195e-03 3.261e-02 0.190 0.849358

Owner\_age30-39 -1.888e-02 3.093e-02 -0.610 0.541732

Owner\_age40-49 2.675e-02 3.437e-02 0.778 0.436496

Owner\_age>50 1.378e-02 3.614e-02 0.381 0.702983

Owner\_dog\_expHad dog 5.720e-03 2.851e-02 0.201 0.841031

Owner\_dog\_expNever had dog 3.927e-02 3.441e-02 1.141 0.253966

How\_many\_dogs\_in\_houseOne -7.734e-03 2.513e-02 -0.308 0.758290

How\_many\_dogs\_in\_houseTwo more -3.928e-02 3.074e-02 -1.278 0.201550

How\_many\_peopleTwo -1.643e-02 3.693e-02 -0.445 0.656570

How\_many\_peopleThree 1.715e-02 4.468e-02 0.384 0.701112

How\_many\_peopleFour more -1.290e-02 4.579e-02 -0.282 0.778238

ChildYes 6.777e-03 3.261e-02 0.208 0.835414

Age\_of\_dog\_when\_arrived7-12w 2.329e-02 2.871e-02 0.811 0.417254

Age\_of\_dog\_when\_arrived3-12m -2.839e-02 3.685e-02 -0.770 0.441207

Age\_of\_dog\_when\_arrived>1y -2.719e-02 4.039e-02 -0.673 0.500959

get\_dogBorn bought 1.028e-02 3.922e-02 0.262 0.793228

get\_dogPresent 3.955e-02 3.407e-02 1.161 0.245918

Where\_dog\_is\_keptGarden 5.770e-02 3.861e-02 1.494 0.135393

Where\_dog\_is\_keptApartment 2.860e-02 3.620e-02 0.790 0.429654

dog\_obedience2 tasks -4.592e-02 4.253e-02 -1.080 0.280455

dog\_obedience3tasks -1.014e-01 4.067e-02 -2.494 0.012786 \*

dog\_obedience>3 -1.551e-01 3.899e-02 -3.978 7.39e-05 \*\*\*

play30m-1h 1.398e-02 3.966e-02 0.353 0.724483

play1-3h 1.291e-03 4.026e-02 0.032 0.974431

play>3h -9.255e-03 4.901e-02 -0.189 0.850267

commands11-30 -5.344e-03 2.743e-02 -0.195 0.845574

commands>30 -3.665e-02 4.420e-02 -0.829 0.407077

training2-3 3.697e-02 2.992e-02 1.236 0.216874

training4 more -9.897e-02 3.443e-02 -2.874 0.004126 \*\*

Time\_dog\_spend\_alone1-2h 4.250e-02 3.758e-02 1.131 0.258339

Time\_dog\_spend\_alone3-8h -1.832e-02 3.376e-02 -0.543 0.587462

Time\_dog\_spend\_alone>8h 2.499e-02 4.288e-02 0.583 0.560189

dog\_beh\_changed\_3monthYes 5.537e-02 2.630e-02 2.105 0.035506 \*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.3614 on 1107 degrees of freedom

(37 observations deleted due to missingness)

Multiple R-squared: 0.2379, Adjusted R-squared: 0.1952

F-statistic: 5.573 on 62 and 1107 DF, p-value: < 2.2e-16

> Residuals <- residuals (lm)

> qqnorm(Residuals)

> shapiro.test (Residuals)

Shapiro-Wilk normality test

data: Residuals

W = 0.99753, p-value = 0.07197

#### Reduced Model

> lm<-lm(bcPower(DPQFAC1new,0.38)~(age+sensory+height+weight+breed+sex+neuter+offleash\_activity+BCS+food+Add\_vitamins+trauma+Health\_prob+medication+Owner\_age+Age\_of\_dog\_when\_arrived+get\_dog+Where\_dog\_is\_kept+dog\_obedience+play+commands+training+dog\_beh\_changed\_3month), data = data, na.action = na.omit)

> etasq(lm, anova = TRUE, type=3)

Anova Table (Type III tests)

Response: bcPower(DPQFAC1new, 0.38)

Partial eta^2 Sum Sq Df F value Pr(>F)

(Intercept) 0.124829 20.844 1 159.4640 < 2.2e-16 \*\*\*

age 0.011887 1.758 5 2.6900 0.0200043 \*

sensory 0.001968 0.288 1 2.2046 0.1378832

height 0.000174 0.025 1 0.1944 0.6593568

weight 0.025333 3.798 1 29.0580 8.565e-08 \*\*\*

breed 0.014598 2.165 1 16.5623 5.039e-05 \*\*\*

sex 0.007998 1.178 1 9.0134 0.0027397 \*\*

neuter 0.002830 0.415 1 3.1731 0.0751303 .

offleash\_activity 0.005374 0.790 4 1.5102 0.1969222

BCS 0.000735 0.108 2 0.4112 0.6629554

food 0.003315 0.486 4 0.9297 0.4458267

Add\_vitamins 0.002058 0.301 3 0.7686 0.5116739

trauma 0.035154 5.325 1 40.7336 2.551e-10 \*\*\*

Health\_prob 0.009634 1.422 4 2.7190 0.0285061 \*

medication 0.000267 0.039 1 0.2986 0.5848677

Owner\_age 0.002695 0.395 3 1.0072 0.3887268

Age\_of\_dog\_when\_arrived 0.003112 0.456 3 1.1633 0.3225946

get\_dog 0.002077 0.304 2 1.1633 0.3128384

Where\_dog\_is\_kept 0.002583 0.378 2 1.4476 0.2355703

dog\_obedience 0.015573 2.312 3 5.8952 0.0005433 \*\*\*

play 0.000243 0.036 3 0.0906 0.9652342

commands 0.000929 0.136 2 0.5200 0.5946902

training 0.012458 1.844 2 7.0517 0.0009050 \*\*\*

dog\_beh\_changed\_3month 0.003734 0.548 1 4.1908 0.0408782 \*

Residuals 146.140 1118

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm)

Call:

lm(formula = bcPower(DPQFAC1new, 0.38) ~ (age + sensory + height +

weight + breed + sex + neuter + offleash\_activity + BCS +

food + Add\_vitamins + trauma + Health\_prob + medication +

Owner\_age + Age\_of\_dog\_when\_arrived + get\_dog + Where\_dog\_is\_kept +

dog\_obedience + play + commands + training + dog\_beh\_changed\_3month),

data = data, na.action = na.omit)

Residuals:

Min 1Q Median 3Q Max

-1.02791 -0.25785 0.00955 0.25295 1.27588

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 1.1909668 0.0943123 12.628 < 2e-16 \*\*\*

ageGroup2 0.0224045 0.0375385 0.597 0.550734

ageGroup3 0.0133799 0.0404446 0.331 0.740842

ageGroup4 -0.0658520 0.0417041 -1.579 0.114612

ageGroup5 -0.0995403 0.0444756 -2.238 0.025412 \*

ageGroup6 -0.0681230 0.0478595 -1.423 0.154900

sensoryPresent -0.0518317 0.0349086 -1.485 0.137883

height 0.0004722 0.0010710 0.441 0.659357

weight -0.0071812 0.0013322 -5.391 8.56e-08 \*\*\*

breedPure -0.1175308 0.0288796 -4.070 5.04e-05 \*\*\*

sexMale -0.0681134 0.0226876 -3.002 0.002740 \*\*

neuterNeutered 0.0435394 0.0244421 1.781 0.075130 .

offleash\_activity30mins/1hour 0.0022214 0.0377642 0.059 0.953103

offleash\_activity1/3 -0.0088849 0.0365374 -0.243 0.807916

offleash\_activity3/7 -0.0267173 0.0430407 -0.621 0.534894

offleash\_activity>7 -0.0809671 0.0423742 -1.911 0.056291 .

BCSNormal -0.0181089 0.0300089 -0.603 0.546331

BCSOverweight 0.0048653 0.0387491 0.126 0.900105

foodTinned and/or Dry food 0.0326935 0.0397199 0.823 0.410626

foodCooked food 0.0011362 0.0319948 0.036 0.971678

foodMixed 0.0127531 0.0333805 0.382 0.702496

foodRaw -0.0426014 0.0357700 -1.191 0.233914

Add\_vitaminsRarely 0.0096573 0.0284679 0.339 0.734497

Add\_vitaminsOften -0.0316406 0.0325334 -0.973 0.330984

Add\_vitaminsDaily 0.0135347 0.0339854 0.398 0.690520

traumaYes 0.1553504 0.0243408 6.382 2.55e-10 \*\*\*

Health\_probTooth problem only 0.0478190 0.0361099 1.324 0.185687

Health\_probJoint & Tooth probs 0.0879641 0.0429820 2.047 0.040937 \*

Health\_probJoint problems only 0.0027748 0.0329954 0.084 0.932995

Health\_probOther disorders 0.0929146 0.0356156 2.609 0.009207 \*\*

medicationYes 0.0176668 0.0323302 0.546 0.584868

Owner\_age30-39 -0.0204600 0.0285536 -0.717 0.473804

Owner\_age40-49 0.0318045 0.0307405 1.035 0.301074

Owner\_age>50 0.0141278 0.0326543 0.433 0.665355

Age\_of\_dog\_when\_arrived7-12w 0.0244779 0.0284406 0.861 0.389606

Age\_of\_dog\_when\_arrived3-12m -0.0317563 0.0367096 -0.865 0.387187

Age\_of\_dog\_when\_arrived>1y -0.0304995 0.0403080 -0.757 0.449412

get\_dogborn bought 0.0128509 0.0389149 0.330 0.741287

get\_dogpresent 0.0443872 0.0337859 1.314 0.189191

Where\_dog\_is\_keptGarden 0.0647794 0.0383700 1.688 0.091635 .

Where\_dog\_is\_keptApartment 0.0354109 0.0357507 0.990 0.322146

dog\_obedience2 tasks -0.0430889 0.0422838 -1.019 0.308405

dog\_obedience3 tasks -0.0967217 0.0404623 -2.390 0.016994 \*

dog\_obedience>3 tasks -0.1499746 0.0388316 -3.862 0.000119 \*\*\*

play30m-1h 0.0119406 0.0394914 0.302 0.762434

play1-3h 0.0037299 0.0400093 0.093 0.925740

play>3h -0.0059172 0.0486697 -0.122 0.903255

commands11-30 -0.0068856 0.0272195 -0.253 0.800342

commands>30 -0.0428306 0.0436009 -0.982 0.326149

training2-3 0.0330983 0.0297725 1.112 0.266504

training4 more -0.1046861 0.0342022 -3.061 0.002260 \*\*

dog\_beh\_changed\_3monthYes 0.0536570 0.0262108 2.047 0.040878 \*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.3615 on 1118 degrees of freedom

(37 observations deleted due to missingness)

Multiple R-squared: 0.2298, Adjusted R-squared: 0.1947

F-statistic: 6.542 on 51 and 1118 DF, p-value: < 2.2e-16

> Residuals <- residuals (lm)

> qqnorm(Residuals)

> shapiro.test (Residuals)

Shapiro-Wilk normality test

data: Residuals

W = 0.99725, p-value = 0.04155

#### No outliers at 3D or above

### DPQFAC2 – Aggression towards people

#### Age only

> lm<-lm(bcPower(DPQFAC2new,-0.66)~(age), data = data, na.action = na.omit)

> etasq(lm, anova = TRUE, type=3)

Anova Table (Type III tests)

Response: bcPower(DPQFAC2new, -0.66)

Partial eta^2 Sum Sq Df F value Pr(>F)

(Intercept) 0.224265 25.020 1 339.9807 <2e-16 \*\*\*

age 0.003733 0.324 5 0.8813 0.4929

Residuals 86.543 1176

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm)

Call:

lm(formula = bcPower(DPQFAC2new, -0.66) ~ (age), data = data,

na.action = na.omit)

Residuals:

Min 1Q Median 3Q Max

-0.41535 -0.24359 -0.01812 0.22600 0.61752

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.373863 0.020276 18.439 <2e-16 \*\*\*

ageGroup2 0.040585 0.026674 1.522 0.128

ageGroup3 0.041482 0.028330 1.464 0.143

ageGroup4 0.021575 0.028046 0.769 0.442

ageGroup5 0.000446 0.029096 0.015 0.988

ageGroup6 0.027053 0.027751 0.975 0.330

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.2713 on 1176 degrees of freedom

(25 observations deleted due to missingness)

Multiple R-squared: 0.003733, Adjusted R-squared: -0.0005029

F-statistic: 0.8813 on 5 and 1176 DF, p-value: 0.4929

#### Full Model

> lm<-lm(bcPower(DPQFAC2new,-0.66)~(age+sensory+height+weight+breed+sex+neuter+offleash\_activity+BCS+food+Add\_vitamins+trauma+Health\_prob+medication+Owner\_age+Owner\_dog\_exp+How\_many\_dogs\_in\_house+How\_many\_people+Child+Age\_of\_dog\_when\_arrived+get\_dog+Where\_dog\_is\_kept+dog\_obedience+play+commands+training+Time\_dog\_spend\_alone+dog\_beh\_changed\_3month), data = data, na.action = na.omit)

> etasq(lm, anova = TRUE, type=3)

Anova Table (Type III tests)

Response: bcPower(DPQFAC2new, -0.66)

Partial eta^2 Sum Sq Df F value Pr(>F)

(Intercept) 0.036626 2.847 1 42.5422 1.045e-10 \*\*\*

age 0.004827 0.363 5 1.0855 0.3665890

sensory 0.001365 0.102 1 1.5293 0.2164841

height 0.000728 0.055 1 0.8151 0.3668135

weight 0.002102 0.158 1 2.3569 0.1250142

breed 0.009620 0.727 1 10.8691 0.0010085 \*\*

sex 0.011958 0.906 1 13.5433 0.0002442 \*\*\*

neuter 0.000988 0.074 1 1.1068 0.2930105

offleash\_activity 0.002839 0.213 4 0.7966 0.5274288

BCS 0.001040 0.078 2 0.5827 0.5585628

food 0.005374 0.405 4 1.5114 0.1965722

Add\_vitamins 0.000610 0.046 3 0.2276 0.8771907

trauma 0.019538 1.492 1 22.2992 2.629e-06 \*\*\*

Health\_prob 0.001030 0.077 4 0.2883 0.8856681

medication 0.000211 0.016 1 0.2357 0.6274546

Owner\_age 0.002368 0.178 3 0.8854 0.4480498

Owner\_dog\_exp 0.001252 0.094 2 0.7016 0.4960020

How\_many\_dogs\_in\_house 0.002552 0.192 2 1.4315 0.2393968

How\_many\_people 0.003518 0.264 3 1.3169 0.2674034

Child 0.000003 0.000 1 0.0029 0.9568355

Age\_of\_dog\_when\_arrived 0.007674 0.579 3 2.8846 0.0347238 \*

get\_dog 0.002574 0.193 2 1.4438 0.2364721

Where\_dog\_is\_kept 0.003992 0.300 2 2.2426 0.1066565

dog\_obedience 0.031860 2.464 3 12.2750 6.636e-08 \*\*\*

play 0.002844 0.214 3 1.0640 0.3634281

commands 0.001411 0.106 2 0.7904 0.4539216

training 0.001415 0.106 2 0.7930 0.4527402

Time\_dog\_spend\_alone 0.001976 0.148 3 0.7383 0.5292270

dog\_beh\_changed\_3month 0.001338 0.100 1 1.4989 0.2211025

Residuals 74.875 1119

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm)

Call:

lm(formula = bcPower(DPQFAC2new, -0.66) ~ (age + sensory +

height + weight + breed + sex + neuter + offleash\_activity +

BCS + food + Add\_vitamins + trauma + Health\_prob + medication +

Owner\_age + Owner\_dog\_exp + How\_many\_dogs\_in\_house + How\_many\_people +

Child + Age\_of\_dog\_when\_arrived + get\_dog + Where\_dog\_is\_kept +

dog\_obedience + play + commands + training + Time\_dog\_spend\_alone +

dog\_beh\_changed\_3month), data = data, na.action = na.omit)

Residuals:

Min 1Q Median 3Q Max

-0.58478 -0.20131 -0.00455 0.19231 0.64776

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 5.075e-01 7.781e-02 6.522 1.05e-10 \*\*\*

ageGroup2 2.520e-02 2.690e-02 0.937 0.349022

ageGroup3 1.831e-02 2.877e-02 0.637 0.524536

ageGroup4 -1.643e-03 2.995e-02 -0.055 0.956262

ageGroup5 -2.600e-02 3.166e-02 -0.821 0.411695

ageGroup6 -3.357e-02 3.406e-02 -0.986 0.324478

sensoryPresent -3.075e-02 2.487e-02 -1.237 0.216484

height -6.940e-04 7.687e-04 -0.903 0.366813

weight -1.464e-03 9.537e-04 -1.535 0.125014

breedPure -6.816e-02 2.067e-02 -3.297 0.001009 \*\*

sexMale 6.002e-02 1.631e-02 3.680 0.000244 \*\*\*

neuterNeutered -1.851e-02 1.760e-02 -1.052 0.293010

offleash\_activity30mins/1hour 1.754e-02 2.713e-02 0.646 0.518133

offleash\_activity1/3 9.334e-05 2.624e-02 0.004 0.997162

offleash\_activity3/7 -1.561e-02 3.106e-02 -0.502 0.615443

offleash\_activity>7 -2.751e-02 3.037e-02 -0.906 0.365204

BCSNormal -1.796e-02 2.163e-02 -0.830 0.406547

BCSOverweight -5.773e-04 2.776e-02 -0.021 0.983415

foodTinned and/or Dry food -1.003e-02 2.832e-02 -0.354 0.723376

foodCooked food 3.952e-02 2.309e-02 1.711 0.087339 .

foodMixed 3.902e-02 2.423e-02 1.610 0.107644

foodRaw 1.878e-02 2.545e-02 0.738 0.460624

Add\_vitaminsRarely -1.333e-02 2.039e-02 -0.654 0.513252

Add\_vitaminsOften 1.723e-03 2.342e-02 0.074 0.941348

Add\_vitaminsDaily -9.052e-03 2.449e-02 -0.370 0.711746

traumaYes 8.221e-02 1.741e-02 4.722 2.63e-06 \*\*\*

Health\_probTooth problem only 1.839e-02 2.573e-02 0.715 0.475028

Health\_probJoint & Tooth probs -1.008e-02 3.096e-02 -0.325 0.744889

Health\_probJoint problems only -7.726e-03 2.370e-02 -0.326 0.744471

Health\_probOther disorders -1.100e-03 2.550e-02 -0.043 0.965596

medicationYes 1.133e-02 2.333e-02 0.485 0.627455

Owner\_age30-39 4.995e-03 2.188e-02 0.228 0.819463

Owner\_age40-49 3.025e-02 2.436e-02 1.242 0.214562

Owner\_age>50 3.207e-02 2.586e-02 1.240 0.215123

Owner\_dog\_expHad a dog before 9.348e-03 2.027e-02 0.461 0.644694

Owner\_dog\_expNever had a dog 2.793e-02 2.436e-02 1.146 0.251923

How\_many\_dogs\_in\_houseOne 1.553e-02 1.790e-02 0.868 0.385790

How\_many\_dogs\_in\_houseTwo more 3.684e-02 2.182e-02 1.689 0.091557 .

How\_many\_peopleTwo people -1.197e-02 2.617e-02 -0.458 0.647397

How\_many\_peopleThree people -1.627e-02 3.166e-02 -0.514 0.607506

How\_many\_peopleFour more 2.494e-02 3.239e-02 0.770 0.441458

ChildYes -1.256e-03 2.319e-02 -0.054 0.956835

Age\_of\_dog\_when\_arrived7-12w 1.658e-02 2.049e-02 0.809 0.418602

Age\_of\_dog\_when\_arrived3-12m -7.096e-03 2.613e-02 -0.272 0.786025

Age\_of\_dog\_when\_arrived>1y -6.364e-02 2.872e-02 -2.216 0.026921 \*

get\_dogborn bought 1.195e-02 2.789e-02 0.429 0.668302

get\_dogpresent 3.626e-02 2.425e-02 1.495 0.135103

Where\_dog\_is\_keptGarden 9.293e-03 2.750e-02 0.338 0.735537

Where\_dog\_is\_keptApartment -3.390e-02 2.563e-02 -1.323 0.186119

dog\_obedience2 tasks -1.390e-03 3.043e-02 -0.046 0.963562

dog\_obedience3 tasks -1.191e-01 2.913e-02 -4.091 4.61e-05 \*\*\*

dog\_obedience>3 tasks -1.256e-01 2.789e-02 -4.503 7.40e-06 \*\*\*

play30m-1h -3.656e-02 2.838e-02 -1.288 0.197924

play1-3h -3.775e-02 2.894e-02 -1.305 0.192322

play>3h -7.837e-03 3.515e-02 -0.223 0.823597

commands11-30 2.225e-02 1.945e-02 1.144 0.252967

commands>30 3.647e-03 3.127e-02 0.117 0.907173

training2-3 -2.425e-02 2.132e-02 -1.137 0.255661

training4 more 4.053e-03 2.458e-02 0.165 0.869061

Time\_dog\_spend\_alone1-2h 3.823e-02 2.658e-02 1.438 0.150613

Time\_dog\_spend\_alone3-8h 3.028e-02 2.399e-02 1.262 0.207181

Time\_dog\_spend\_alone>8h 2.503e-02 3.054e-02 0.819 0.412691

dog\_beh\_changed\_3monthYes 2.296e-02 1.875e-02 1.224 0.221103

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.2587 on 1119 degrees of freedom

(25 observations deleted due to missingness)

Multiple R-squared: 0.1381, Adjusted R-squared: 0.09029

F-statistic: 2.891 on 62 and 1119 DF, p-value: 4.377e-12

> Residuals <- residuals (lm)

> qqnorm(Residuals)

> shapiro.test (Residuals)

Shapiro-Wilk normality test

data: Residuals

W = 0.9839, p-value = 3.652e-10

#### Reduced Model

> lm<-lm(bcPower(DPQFAC2new,-0.66)~(age+sensory+height+weight+breed+sex+neuter+offleash\_activity+BCS+food+Add\_vitamins+trauma+Health\_prob+medication+Owner\_age+Age\_of\_dog\_when\_arrived+get\_dog+Where\_dog\_is\_kept+dog\_obedience+play+commands+training+dog\_beh\_changed\_3month), data = data, na.action = na.omit)

> etasq(lm, anova = TRUE, type=3)

Anova Table (Type III tests)

Response: bcPower(DPQFAC2new, -0.66)

Partial eta^2 Sum Sq Df F value Pr(>F)

(Intercept) 0.057546 4.612 1 68.9981 2.793e-16 \*\*\*

age 0.003953 0.300 5 0.8970 0.4822836

sensory 0.001528 0.116 1 1.7293 0.1887715

height 0.000511 0.039 1 0.5778 0.4473468

weight 0.002268 0.172 1 2.5689 0.1092600

breed 0.008869 0.676 1 10.1116 0.0015134 \*\*

sex 0.012571 0.962 1 14.3861 0.0001568 \*\*\*

neuter 0.000970 0.073 1 1.0973 0.2950816

offleash\_activity 0.002534 0.192 4 0.7175 0.5799772

BCS 0.001225 0.093 2 0.6931 0.5002441

food 0.004842 0.367 4 1.3744 0.2406852

Add\_vitamins 0.000505 0.038 3 0.1904 0.9029689

trauma 0.019218 1.480 1 22.1420 2.845e-06 \*\*\*

Health\_prob 0.001258 0.095 4 0.3559 0.8400439

medication 0.000263 0.020 1 0.2969 0.5859619

Owner\_age 0.002726 0.206 3 1.0297 0.3785298

Age\_of\_dog\_when\_arrived 0.008174 0.622 3 3.1044 0.0258013 \*

get\_dog 0.002085 0.158 2 1.1803 0.3075532

Where\_dog\_is\_kept 0.004411 0.335 2 2.5034 0.0822618 .

dog\_obedience 0.031266 2.438 3 12.1569 7.822e-08 \*\*\*

play 0.002490 0.189 3 0.9404 0.4204168

commands 0.001536 0.116 2 0.8692 0.4195511

training 0.001634 0.124 2 0.9246 0.3969717

dog\_beh\_changed\_3month 0.001194 0.090 1 1.3504 0.2454477

Residuals 75.527 1130

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm)

Call:

lm(formula = bcPower(DPQFAC2new, -0.66) ~ (age + sensory +

height + weight + breed + sex + neuter + offleash\_activity +

BCS + food + Add\_vitamins + trauma + Health\_prob + medication +

Owner\_age + Age\_of\_dog\_when\_arrived + get\_dog + Where\_dog\_is\_kept +

dog\_obedience + play + commands + training + dog\_beh\_changed\_3month),

data = data, na.action = na.omit)

Residuals:

Min 1Q Median 3Q Max

-0.60096 -0.20532 -0.00319 0.19301 0.67084

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 5.575e-01 6.712e-02 8.307 2.79e-16 \*\*\*

ageGroup2 2.583e-02 2.671e-02 0.967 0.333844

ageGroup3 2.028e-02 2.867e-02 0.707 0.479480

ageGroup4 4.132e-03 2.966e-02 0.139 0.889250

ageGroup5 -1.947e-02 3.140e-02 -0.620 0.535381

ageGroup6 -2.612e-02 3.375e-02 -0.774 0.439172

sensoryPresent -3.255e-02 2.475e-02 -1.315 0.188771

height -5.802e-04 7.633e-04 -0.760 0.447347

weight -1.520e-03 9.481e-04 -1.603 0.109260

breedPure -6.543e-02 2.058e-02 -3.180 0.001513 \*\*

sexMale 6.132e-02 1.617e-02 3.793 0.000157 \*\*\*

neuterNeutered -1.834e-02 1.751e-02 -1.048 0.295082

offleash\_activity30mins/1hour 1.834e-02 2.697e-02 0.680 0.496595

offleash\_activity1/3 -7.391e-04 2.613e-02 -0.028 0.977437

offleash\_activity3/7 -1.047e-02 3.070e-02 -0.341 0.733221

offleash\_activity>7 -2.519e-02 3.018e-02 -0.834 0.404224

BCSNormal -2.070e-02 2.134e-02 -0.970 0.332227

BCSOverweight -3.320e-03 2.745e-02 -0.121 0.903753

foodTinned and/or Dry food -8.572e-03 2.802e-02 -0.306 0.759702

foodCooked food 3.835e-02 2.277e-02 1.685 0.092319 .

foodMixed 3.656e-02 2.380e-02 1.537 0.124682

foodRaw 2.132e-02 2.529e-02 0.843 0.399471

Add\_vitaminsRarely -1.220e-02 2.021e-02 -0.604 0.546170

Add\_vitaminsOften 1.051e-03 2.314e-02 0.045 0.963788

Add\_vitaminsDaily -9.126e-03 2.421e-02 -0.377 0.706286

traumaYes 8.143e-02 1.730e-02 4.706 2.85e-06 \*\*\*

Health\_probTooth problem only 2.061e-02 2.555e-02 0.807 0.420009

Health\_probJoint & Tooth probs -1.276e-02 3.074e-02 -0.415 0.678142

Health\_probJoint problems only -6.202e-03 2.353e-02 -0.264 0.792183

Health\_probOther disorders 7.437e-04 2.528e-02 0.029 0.976540

medicationYes 1.260e-02 2.313e-02 0.545 0.585962

Owner\_age30-39 -1.978e-03 2.021e-02 -0.098 0.922074

Owner\_age40-49 3.072e-02 2.180e-02 1.409 0.159038

Owner\_age>50 2.135e-02 2.339e-02 0.913 0.361651

Age\_of\_dog\_when\_arrived7-12w 1.599e-02 2.027e-02 0.789 0.430498

Age\_of\_dog\_when\_arrived3-12m -5.703e-03 2.600e-02 -0.219 0.826387

Age\_of\_dog\_when\_arrived>1y -6.639e-02 2.864e-02 -2.318 0.020614 \*

get\_dogborn bought 1.131e-02 2.766e-02 0.409 0.682807

get\_dogpresent 3.274e-02 2.403e-02 1.363 0.173269

Where\_dog\_is\_keptGarden 8.126e-03 2.731e-02 0.298 0.766110

Where\_dog\_is\_keptApartment -3.644e-02 2.532e-02 -1.439 0.150411

dog\_obedience2 tasks -2.487e-03 3.020e-02 -0.082 0.934368

dog\_obedience3 tasks -1.179e-01 2.895e-02 -4.072 4.98e-05 \*\*\*

dog\_obedience>3 tasks -1.256e-01 2.774e-02 -4.530 6.54e-06 \*\*\*

play30m-1h -3.467e-02 2.822e-02 -1.229 0.219465

play1-3h -3.714e-02 2.871e-02 -1.293 0.196117

play>3h -9.976e-03 3.483e-02 -0.286 0.774595

commands11-30 2.211e-02 1.930e-02 1.146 0.252223

commands>30 -9.168e-06 3.085e-02 0.000 0.999763

training2-3 -2.680e-02 2.119e-02 -1.265 0.206185

training4 more 2.076e-03 2.438e-02 0.085 0.932141

dog\_beh\_changed\_3monthYes 2.167e-02 1.865e-02 1.162 0.245448

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.2585 on 1130 degrees of freedom

(25 observations deleted due to missingness)

Multiple R-squared: 0.1305, Adjusted R-squared: 0.0913

F-statistic: 3.327 on 51 and 1130 DF, p-value: 2.13e-13

> Residuals <- residuals (lm)

> qqnorm(Residuals)

> shapiro.test (Residuals)

Shapiro-Wilk normality test

data: Residuals

W = 0.98401, p-value = 4.081e-10

#### Outliers removed N = 1166 (16 outliers removed)

> lm<-lm(bcPower(outDPQFAC2new,-0.66)~(age+sensory+height+weight+breed+sex+neuter+offleash\_activity+BCS+food+Add\_vitamins+trauma+Health\_prob+medication+Owner\_age+Age\_of\_dog\_when\_arrived+get\_dog+Where\_dog\_is\_kept+dog\_obedience+play+commands+training+dog\_beh\_changed\_3month), data = data, na.action = na.omit)

> etasq(lm, anova = TRUE, type=3)

Anova Table (Type III tests)

Response: bcPower(outDPQFAC2new, -0.66)

Partial eta^2 Sum Sq Df F value Pr(>F)

(Intercept) 0.052751 3.977 1 62.0374 7.962e-15 \*\*\*

age 0.003949 0.283 5 0.8832 0.4915656

sensory 0.001543 0.110 1 1.7213 0.1897976

height 0.000602 0.043 1 0.6710 0.4128699

weight 0.002915 0.209 1 3.2568 0.0713964 .

breed 0.007616 0.548 1 8.5495 0.0035260 \*\*

sex 0.012703 0.919 1 14.3331 0.0001613 \*\*\*

neuter 0.000944 0.067 1 1.0521 0.3052398

offleash\_activity 0.002758 0.197 4 0.7702 0.5446747

BCS 0.001678 0.120 2 0.9361 0.3924497

food 0.005960 0.428 4 1.6699 0.1546523

Add\_vitamins 0.000391 0.028 3 0.1452 0.9327411

trauma 0.018203 1.324 1 20.6541 6.102e-06 \*\*\*

Health\_prob 0.001328 0.095 4 0.3703 0.8298985

medication 0.000139 0.010 1 0.1544 0.6944261

Owner\_age 0.004538 0.326 3 1.6927 0.1668249

Age\_of\_dog\_when\_arrived 0.007614 0.548 3 2.8489 0.0364351 \*

get\_dog 0.001775 0.127 2 0.9905 0.3717044

Where\_dog\_is\_kept 0.005515 0.396 2 3.0891 0.0459341 \*

dog\_obedience 0.028452 2.091 3 10.8746 4.820e-07 \*\*\*

play 0.002971 0.213 3 1.1067 0.3453359

commands 0.001194 0.085 2 0.6658 0.5140884

training 0.001557 0.111 2 0.8689 0.4197142

dog\_beh\_changed\_3month 0.000592 0.042 1 0.6603 0.4166268

Residuals 71.408 1114

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm)

Call:

lm(formula = bcPower(outDPQFAC2new, -0.66) ~ (age + sensory +

height + weight + breed + sex + neuter + offleash\_activity +

BCS + food + Add\_vitamins + trauma + Health\_prob + medication +

Owner\_age + Age\_of\_dog\_when\_arrived + get\_dog + Where\_dog\_is\_kept +

dog\_obedience + play + commands + training + dog\_beh\_changed\_3month),

data = data, na.action = na.omit)

Residuals:

Min 1Q Median 3Q Max

-0.59885 -0.20329 0.00115 0.19292 0.62547

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 5.232e-01 6.642e-02 7.876 7.96e-15 \*\*\*

ageGroup2 3.304e-02 2.654e-02 1.245 0.213466

ageGroup3 2.406e-02 2.842e-02 0.847 0.397422

ageGroup4 1.888e-02 2.942e-02 0.642 0.521300

ageGroup5 -1.016e-02 3.115e-02 -0.326 0.744307

ageGroup6 -1.386e-02 3.363e-02 -0.412 0.680264

sensoryPresent -3.206e-02 2.444e-02 -1.312 0.189798

height -6.230e-04 7.605e-04 -0.819 0.412870

weight -1.698e-03 9.410e-04 -1.805 0.071396 .

breedPure -5.949e-02 2.035e-02 -2.924 0.003526 \*\*

sexMale 6.040e-02 1.596e-02 3.786 0.000161 \*\*\*

neuterNeutered -1.770e-02 1.726e-02 -1.026 0.305240

offleash\_activity30mins/1hour 2.188e-02 2.674e-02 0.818 0.413335

offleash\_activity1/3 3.336e-03 2.582e-02 0.129 0.897209

offleash\_activity3/7 -9.958e-03 3.039e-02 -0.328 0.743238

offleash\_activity>7 -2.147e-02 2.987e-02 -0.719 0.472507

BCSNormal -1.821e-02 2.115e-02 -0.861 0.389287

BCSOverweight 6.676e-03 2.712e-02 0.246 0.805628

foodTinned and/or Dry food -1.430e-02 2.764e-02 -0.517 0.604990

foodCooked food 3.764e-02 2.243e-02 1.678 0.093564 .

foodMixed 3.932e-02 2.347e-02 1.676 0.094073 .

foodRaw 2.449e-02 2.492e-02 0.983 0.325947

Add\_vitaminsRarely 6.465e-06 2.001e-02 0.000 0.999742

Add\_vitaminsOften 1.284e-02 2.288e-02 0.561 0.574963

Add\_vitaminsDaily 1.252e-03 2.396e-02 0.052 0.958332

traumaYes 7.756e-02 1.707e-02 4.545 6.10e-06 \*\*\*

Health\_probTooth problem only 1.714e-02 2.517e-02 0.681 0.496105

Health\_probJoint & Tooth probs -1.478e-02 3.020e-02 -0.489 0.624762

Health\_probJoint problems only -1.113e-02 2.327e-02 -0.478 0.632508

Health\_probOther disorders -4.846e-03 2.498e-02 -0.194 0.846221

medicationYes 8.968e-03 2.282e-02 0.393 0.694426

Owner\_age30-39 6.311e-03 2.000e-02 0.316 0.752408

Owner\_age40-49 4.405e-02 2.147e-02 2.052 0.040422 \*

Owner\_age>50 2.730e-02 2.314e-02 1.180 0.238339

Age\_of\_dog\_when\_arrived7-12w 2.090e-02 2.005e-02 1.043 0.297334

Age\_of\_dog\_when\_arrived3-12m 1.365e-03 2.569e-02 0.053 0.957639

Age\_of\_dog\_when\_arrived>1y -5.624e-02 2.828e-02 -1.989 0.046953 \*

get\_dogborn bought 1.128e-02 2.727e-02 0.414 0.679275

get\_dogpresent 3.004e-02 2.366e-02 1.269 0.204570

Where\_dog\_is\_keptGarden 1.173e-02 2.694e-02 0.435 0.663365

Where\_dog\_is\_keptApartment -3.783e-02 2.501e-02 -1.513 0.130659

dog\_obedience2 tasks -1.664e-02 3.003e-02 -0.554 0.579684

dog\_obedience3 tasks -1.189e-01 2.862e-02 -4.154 3.52e-05 \*\*\*

dog\_obedience>3 tasks -1.251e-01 2.744e-02 -4.558 5.74e-06 \*\*\*

play30m-1h -3.656e-02 2.786e-02 -1.312 0.189632

play1-3h -3.254e-02 2.835e-02 -1.148 0.251393

play>3h -2.597e-03 3.439e-02 -0.076 0.939807

commands11-30 1.880e-02 1.907e-02 0.986 0.324406

commands>30 -8.784e-04 3.029e-02 -0.029 0.976874

training2-3 -2.214e-02 2.093e-02 -1.058 0.290370

training4 more 1.003e-02 2.393e-02 0.419 0.675233

dog\_beh\_changed\_3monthYes 1.501e-02 1.848e-02 0.813 0.416627

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.2532 on 1114 degrees of freedom

(41 observations deleted due to missingness)

Multiple R-squared: 0.128, Adjusted R-squared: 0.08807

F-statistic: 3.206 on 51 and 1114 DF, p-value: 1.482e-12

> Residuals <- residuals (lm)

> qqnorm(Residuals)

> shapiro.test (Residuals)

Shapiro-Wilk normality test

data: Residuals

W = 0.98324, p-value = 2.404e-10

### DPQFAC3 – Activity/Excitability

#### Age only

> lm<-lm(bcPower(DPQFAC3new,1.59)~(age), data = data, na.action = na.omit)

> etasq(lm, anova = TRUE, type=3)

Anova Table (Type III tests)

Response: bcPower(DPQFAC3new, 1.59)

Partial eta^2 Sum Sq Df F value Pr(>F)

(Intercept) 0.73934 4430.2 1 3261.861 < 2.2e-16 \*\*\*

age 0.18247 348.6 5 51.337 < 2.2e-16 \*\*\*

Residuals 1561.9 1150

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm)

Call:

lm(formula = bcPower(DPQFAC3new, 1.59) ~ (age), data = data,

na.action = na.omit)

Residuals:

Min 1Q Median 3Q Max

-3.9690 -0.8261 0.0601 0.8153 4.0475

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 4.98884 0.08735 57.113 < 2e-16 \*\*\*

ageGroup2 -0.55584 0.11518 -4.826 1.58e-06 \*\*\*

ageGroup3 -0.86016 0.12285 -7.002 4.29e-12 \*\*\*

ageGroup4 -1.06816 0.12126 -8.809 < 2e-16 \*\*\*

ageGroup5 -1.28892 0.12655 -10.185 < 2e-16 \*\*\*

ageGroup6 -1.75197 0.11995 -14.606 < 2e-16 \*\*\*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1.165 on 1150 degrees of freedom

(51 observations deleted due to missingness)

Multiple R-squared: 0.1825, Adjusted R-squared: 0.1789

F-statistic: 51.34 on 5 and 1150 DF, p-value: < 2.2e-16

> Residuals <- residuals (lm)

> qqnorm(Residuals)

> shapiro.test (Residuals)

Shapiro-Wilk normality test

data: Residuals

W = 0.99788, p-value = 0.146

|  |
| --- |
| > com=glht(lm,linfct=mcp(age="Tukey"))  > summary(com)  Simultaneous Tests for General Linear Hypotheses  Multiple Comparisons of Means: Tukey Contrasts  Fit: lm(formula = bcPower(DPQFAC3new, 1.59) ~ (age), data = data,  na.action = na.omit)  Linear Hypotheses:  Estimate Std. Error t value Pr(>|t|)  Group2 - Group1 == 0 -0.5558 0.1152 -4.826 < 0.001 \*\*\*  Group3 - Group1 == 0 -0.8602 0.1229 -7.002 < 0.001 \*\*\*  Group4 - Group1 == 0 -1.0682 0.1213 -8.809 < 0.001 \*\*\*  Group5 - Group1 == 0 -1.2889 0.1265 -10.185 < 0.001 \*\*\*  Group6 - Group1 == 0 -1.7520 0.1199 -14.606 < 0.001 \*\*\*  Group3 - Group2 == 0 -0.3043 0.1144 -2.659 0.08409 .  Group4 - Group2 == 0 -0.5123 0.1127 -4.544 < 0.001 \*\*\*  Group5 - Group2 == 0 -0.7331 0.1184 -6.191 < 0.001 \*\*\*  Group6 - Group2 == 0 -1.1961 0.1113 -10.745 < 0.001 \*\*\*  Group4 - Group3 == 0 -0.2080 0.1206 -1.725 0.51461  Group5 - Group3 == 0 -0.4288 0.1259 -3.406 0.00884 \*\*  Group6 - Group3 == 0 -0.8918 0.1192 -7.479 < 0.001 \*\*\*  Group5 - Group4 == 0 -0.2208 0.1243 -1.776 0.48124  Group6 - Group4 == 0 -0.6838 0.1176 -5.815 < 0.001 \*\*\*  Group6 - Group5 == 0 -0.4631 0.1230 -3.763 0.00250 \*\*  ---  Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1  (Adjusted p values reported -- single-step method) |
|  |
| |  | | --- | |  | |

#### Full Model

> lm<-lm(bcPower(DPQFAC3new,1.51)~(age+sensory+height+weight+breed+sex+neuter+offleash\_activity+BCS+food+Add\_vitamins+trauma+Health\_prob+medication+Owner\_age+Owner\_dog\_exp+How\_many\_dogs\_in\_house+How\_many\_people+Child+Age\_of\_dog\_when\_arrived+get\_dog+Where\_dog\_is\_kept+dog\_obedience+play+commands+training+Time\_dog\_spend\_alone+dog\_beh\_changed\_3month), data = data, na.action = na.omit)

> etasq(lm, anova = TRUE, type=3)

Anova Table (Type III tests)

Response: bcPower(DPQFAC3new, 1.51)

Partial eta^2 Sum Sq Df F value Pr(>F)

(Intercept) 0.169072 211.80 1 222.3973 < 2.2e-16 \*\*\*

age 0.074390 83.66 5 17.5685 < 2.2e-16 \*\*\*

sensory 0.005915 6.19 1 6.5032 0.010904 \*

height 0.000030 0.03 1 0.0332 0.855383

weight 0.001106 1.15 1 1.2100 0.271579

breed 0.003239 3.38 1 3.5517 0.059750 .

sex 0.003278 3.42 1 3.5948 0.058224 .

neuter 0.000031 0.03 1 0.0334 0.855018

offleash\_activity 0.007675 8.05 4 2.1133 0.077082 .

BCS 0.009753 10.25 2 5.3824 0.004720 \*\*

food 0.004945 5.17 4 1.3579 0.246575

Add\_vitamins 0.005371 5.62 3 1.9672 0.117164

trauma 0.001493 1.56 1 1.6343 0.201380

Health\_prob 0.003746 3.91 4 1.0273 0.391934

medication 0.001553 1.62 1 1.7005 0.192497

Owner\_age 0.002554 2.67 3 0.9330 0.424041

Owner\_dog\_exp 0.001990 2.08 2 1.0900 0.336589

How\_many\_dogs\_in\_house 0.001175 1.23 2 0.6431 0.525842

How\_many\_people 0.000871 0.91 3 0.3176 0.812653

Child 0.000393 0.41 1 0.4293 0.512493

Age\_of\_dog\_when\_arrived 0.037269 40.30 3 14.1039 5.042e-09 \*\*\*

get\_dog 0.008831 9.27 2 4.8693 0.007846 \*\*

Where\_dog\_is\_kept 0.001951 2.04 2 1.0686 0.343858

dog\_obedience 0.033851 36.47 3 12.7651 3.341e-08 \*\*\*

play 0.005261 5.51 3 1.9269 0.123462

commands 0.005860 6.14 2 3.2212 0.040287 \*

training 0.002250 2.35 2 1.2326 0.291934

Time\_dog\_spend\_alone 0.000763 0.79 3 0.2781 0.841197

dog\_beh\_changed\_3month 0.000044 0.05 1 0.0479 0.826799

Residuals 1040.94 1093

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm)

Call:

lm(formula = bcPower(DPQFAC3new, 1.51) ~ (age + sensory + height +

weight + breed + sex + neuter + offleash\_activity + BCS +

food + Add\_vitamins + trauma + Health\_prob + medication +

Owner\_age + Owner\_dog\_exp + How\_many\_dogs\_in\_house + How\_many\_people +

Child + Age\_of\_dog\_when\_arrived + get\_dog + Where\_dog\_is\_kept +

dog\_obedience + play + commands + training + Time\_dog\_spend\_alone +

dog\_beh\_changed\_3month), data = data, na.action = na.omit)

Residuals:

Min 1Q Median 3Q Max

-3.6323 -0.6209 0.0255 0.6255 3.4468

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 4.4563832 0.2988256 14.913 < 2e-16 \*\*\*

ageGroup2 -0.3919530 0.1021731 -3.836 0.000132 \*\*\*

ageGroup3 -0.6601073 0.1096132 -6.022 2.35e-09 \*\*\*

ageGroup4 -0.7544570 0.1144998 -6.589 6.86e-11 \*\*\*

ageGroup5 -0.9085286 0.1213981 -7.484 1.48e-13 \*\*\*

ageGroup6 -1.0835702 0.1296519 -8.358 < 2e-16 \*\*\*

sensoryPresent -0.2416198 0.0947478 -2.550 0.010904 \*

height -0.0005333 0.0029254 -0.182 0.855383

weight -0.0039644 0.0036040 -1.100 0.271579

breedPure 0.1485378 0.0788169 1.885 0.059750 .

sexMale 0.1179781 0.0622250 1.896 0.058224 .

neuterNeutered 0.0123141 0.0673777 0.183 0.855018

offleash\_activity30mins/1hour -0.0169287 0.1038273 -0.163 0.870512

offleash\_activity1/3 0.0824816 0.0999533 0.825 0.409437

offleash\_activity3/7 0.1989220 0.1180553 1.685 0.092276 .

offleash\_activity>7 0.2356478 0.1154445 2.041 0.041469 \*

BCSNormal -0.0005432 0.0823522 -0.007 0.994738

BCSOverweight -0.2630541 0.1055342 -2.493 0.012829 \*

foodTinned and/or Dry food -0.1765210 0.1094041 -1.613 0.106930

foodCooked food -0.0678110 0.0888180 -0.763 0.445340

foodMixed -0.0788366 0.0928779 -0.849 0.396168

foodRaw -0.2001722 0.0977710 -2.047 0.040862 \*

Add\_vitaminsRarely -0.0632651 0.0780424 -0.811 0.417743

Add\_vitaminsOften 0.1385390 0.0897279 1.544 0.122880

Add\_vitaminsDaily 0.0487249 0.0937762 0.520 0.603456

traumaYes -0.0859092 0.0672006 -1.278 0.201380

Health\_probTooth problem only -0.0280801 0.0989661 -0.284 0.776667

Health\_probJoint & Tooth probs -0.2237856 0.1181688 -1.894 0.058518 .

Health\_probJoint problems only -0.0334968 0.0906248 -0.370 0.711737

Health\_probOther disorders -0.0793772 0.0986042 -0.805 0.420990

medicationYes -0.1162779 0.0891680 -1.304 0.192497

Owner\_age30-39 -0.1082484 0.0838418 -1.291 0.196941

Owner\_age40-49 0.0071642 0.0932533 0.077 0.938777

Owner\_age>50 -0.0885826 0.0988123 -0.896 0.370197

Owner\_dog\_expHad a dog before 0.0360795 0.0773715 0.466 0.641083

Owner\_dog\_expNever had a dog -0.0771198 0.0933142 -0.826 0.408728

How\_many\_dogs\_in\_houseOne -0.0483356 0.0682830 -0.708 0.479176

How\_many\_dogs\_in\_houseTwo more -0.0924617 0.0831515 -1.112 0.266397

How\_many\_peopleTwo people 0.0897112 0.0997384 0.899 0.368603

How\_many\_peopleThree people 0.0744624 0.1207552 0.617 0.537601

How\_many\_peopleFour more 0.0469381 0.1237845 0.379 0.704619

ChildYes 0.0581254 0.0887175 0.655 0.512493

Age\_of\_dog\_when\_arrived7-12w -0.2135075 0.0786436 -2.715 0.006735 \*\*

Age\_of\_dog\_when\_arrived3-12m -0.4796543 0.0998467 -4.804 1.77e-06 \*\*\*

Age\_of\_dog\_when\_arrived>1y -0.6718165 0.1095842 -6.131 1.22e-09 \*\*\*

get\_dogborn bought -0.3316150 0.1065334 -3.113 0.001901 \*\*

get\_dogpresent -0.1823462 0.0927892 -1.965 0.049648 \*

Where\_dog\_is\_keptGarden -0.0687641 0.1052142 -0.654 0.513531

Where\_dog\_is\_keptApartment -0.1386509 0.0985523 -1.407 0.159749

dog\_obedience2 tasks 0.2923462 0.1151357 2.539 0.011250 \*

dog\_obedience3 tasks 0.3192787 0.1111397 2.873 0.004148 \*\*

dog\_obedience>3 tasks 0.6188376 0.1056294 5.859 6.17e-09 \*\*\*

play30m-1h 0.2433437 0.1076485 2.261 0.023984 \*

play1-3h 0.1493527 0.1096182 1.362 0.173327

play>3h 0.1252774 0.1343945 0.932 0.351459

commands11-30 0.0827449 0.0742818 1.114 0.265553

commands>30 0.3039311 0.1199926 2.533 0.011451 \*

training2-3 -0.0771670 0.0810154 -0.952 0.341056

training4 more 0.0843168 0.0937302 0.900 0.368548

Time\_dog\_spend\_alone1-2h 0.0704978 0.1021305 0.690 0.490169

Time\_dog\_spend\_alone3-8h 0.0173918 0.0917693 0.190 0.849723

Time\_dog\_spend\_alone>8h -0.0101965 0.1174581 -0.087 0.930839

dog\_beh\_changed\_3monthYes -0.0157364 0.0719011 -0.219 0.826799

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.9759 on 1093 degrees of freedom

(51 observations deleted due to missingness)

Multiple R-squared: 0.3363, Adjusted R-squared: 0.2987

F-statistic: 8.935 on 62 and 1093 DF, p-value: < 2.2e-16

> Residuals <- residuals (lm)

> qqnorm(Residuals)

> shapiro.test (Residuals)

Shapiro-Wilk normality test

data: Residuals

W = 0.99755, p-value = 0.07853

#### Reduced Model

> lm<-lm(bcPower(DPQFAC3new,1.51)~(age+sensory+height+weight+breed+sex+neuter+offleash\_activity+BCS+food+Add\_vitamins+trauma+Health\_prob+medication+Owner\_age+Age\_of\_dog\_when\_arrived+get\_dog+Where\_dog\_is\_kept+dog\_obedience+play+commands+training+dog\_beh\_changed\_3month), data = data, na.action = na.omit)

> etasq(lm, anova = TRUE, type=3)

Anova Table (Type III tests)

Response: bcPower(DPQFAC3new, 1.51)

Partial eta^2 Sum Sq Df F value Pr(>F)

(Intercept) 0.221513 297.75 1 314.1355 < 2.2e-16 \*\*\*

age 0.075970 86.03 5 18.1532 < 2.2e-16 \*\*\*

sensory 0.005877 6.19 1 6.5261 0.010764 \*

height 0.000124 0.13 1 0.1372 0.711144

weight 0.000849 0.89 1 0.9380 0.332994

breed 0.003058 3.21 1 3.3866 0.065995 .

sex 0.003435 3.61 1 3.8057 0.051332 .

neuter 0.000000 0.00 1 0.0003 0.985089

offleash\_activity 0.007332 7.73 4 2.0386 0.086862 .

BCS 0.009736 10.29 2 5.4270 0.004514 \*\*

food 0.004888 5.14 4 1.3556 0.247383

Add\_vitamins 0.005239 5.51 3 1.9379 0.121693

trauma 0.001464 1.53 1 1.6190 0.203503

Health\_prob 0.004418 4.64 4 1.2248 0.298492

medication 0.001559 1.63 1 1.7237 0.189494

Owner\_age 0.002546 2.67 3 0.9394 0.420880

Age\_of\_dog\_when\_arrived 0.037211 40.44 3 14.2231 4.246e-09 \*\*\*

get\_dog 0.008879 9.37 2 4.9451 0.007277 \*\*

Where\_dog\_is\_kept 0.001926 2.02 2 1.0654 0.344936

dog\_obedience 0.033457 36.22 3 12.7383 3.460e-08 \*\*\*

play 0.005220 5.49 3 1.9309 0.122808

commands 0.006101 6.42 2 3.3884 0.034114 \*

training 0.002219 2.33 2 1.2278 0.293346

dog\_beh\_changed\_3month 0.000062 0.06 1 0.0684 0.793801

Residuals 1046.41 1104

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm)

Call:

lm(formula = bcPower(DPQFAC3new, 1.51) ~ (age + sensory + height +

weight + breed + sex + neuter + offleash\_activity + BCS +

food + Add\_vitamins + trauma + Health\_prob + medication +

Owner\_age + Age\_of\_dog\_when\_arrived + get\_dog + Where\_dog\_is\_kept +

dog\_obedience + play + commands + training + dog\_beh\_changed\_3month),

data = data, na.action = na.omit)

Residuals:

Min 1Q Median 3Q Max

-3.6446 -0.6414 0.0243 0.6305 3.4528

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 4.542784 0.256309 17.724 < 2e-16 \*\*\*

ageGroup2 -0.393857 0.101396 -3.884 0.000109 \*\*\*

ageGroup3 -0.660767 0.109066 -6.058 1.88e-09 \*\*\*

ageGroup4 -0.764156 0.113181 -6.752 2.36e-11 \*\*\*

ageGroup5 -0.918138 0.120399 -7.626 5.22e-14 \*\*\*

ageGroup6 -1.089676 0.128602 -8.473 < 2e-16 \*\*\*

sensoryPresent -0.240414 0.094110 -2.555 0.010764 \*

height -0.001074 0.002900 -0.370 0.711144

weight -0.003462 0.003574 -0.969 0.332994

breedPure 0.143972 0.078233 1.840 0.065995 .

sexMale 0.120257 0.061644 1.951 0.051332 .

neuterNeutered 0.001250 0.066842 0.019 0.985089

offleash\_activity30mins/1hour -0.025357 0.102956 -0.246 0.805507

offleash\_activity1/3 0.083642 0.099321 0.842 0.399890

offleash\_activity3/7 0.187261 0.116509 1.607 0.108281

offleash\_activity>7 0.223047 0.114449 1.949 0.051564 .

BCSNormal -0.003058 0.081290 -0.038 0.969998

BCSOverweight -0.264366 0.104303 -2.535 0.011395 \*

foodTinned and/or Dry food -0.161651 0.107939 -1.498 0.134519

foodCooked food -0.057153 0.087438 -0.654 0.513482

foodMixed -0.063948 0.090933 -0.703 0.482055

foodRaw -0.199051 0.097003 -2.052 0.040404 \*

Add\_vitaminsRarely -0.073105 0.077153 -0.948 0.343574

Add\_vitaminsOften 0.127625 0.088375 1.444 0.148985

Add\_vitaminsDaily 0.032663 0.092375 0.354 0.723711

traumaYes -0.084840 0.066678 -1.272 0.203503

Health\_probTooth problem only -0.027681 0.097928 -0.283 0.777486

Health\_probJoint & Tooth probs -0.238089 0.117014 -2.035 0.042120 \*

Health\_probJoint problems only -0.039292 0.089827 -0.437 0.661891

Health\_probOther disorders -0.098853 0.097549 -1.013 0.311106

medicationYes -0.115718 0.088140 -1.313 0.189494

Owner\_age30-39 -0.095092 0.077125 -1.233 0.217854

Owner\_age40-49 0.027330 0.083316 0.328 0.742951

Owner\_age>50 -0.068633 0.089133 -0.770 0.441457

Age\_of\_dog\_when\_arrived7-12w -0.208057 0.077713 -2.677 0.007533 \*\*

Age\_of\_dog\_when\_arrived3-12m -0.474382 0.099213 -4.781 1.98e-06 \*\*\*

Age\_of\_dog\_when\_arrived>1y -0.672949 0.109039 -6.172 9.48e-10 \*\*\*

get\_dogborn bought -0.329687 0.105449 -3.127 0.001815 \*\*

get\_dogpresent -0.173388 0.091738 -1.890 0.059016 .

Where\_dog\_is\_keptGarden -0.066171 0.104258 -0.635 0.525761

Where\_dog\_is\_keptApartment -0.135907 0.097188 -1.398 0.162276

dog\_obedience2 tasks 0.302246 0.114082 2.649 0.008179 \*\*

dog\_obedience3 tasks 0.321454 0.110164 2.918 0.003595 \*\*

dog\_obedience>3 tasks 0.617234 0.104827 5.888 5.18e-09 \*\*\*

play30m-1h 0.238903 0.106737 2.238 0.025405 \*

play1-3h 0.140138 0.108460 1.292 0.196604

play>3h 0.118006 0.132789 0.889 0.374373

commands11-30 0.088798 0.073600 1.206 0.227885

commands>30 0.307511 0.118197 2.602 0.009401 \*\*

training2-3 -0.080240 0.080328 -0.999 0.318062

training4 more 0.078302 0.092814 0.844 0.399051

dog\_beh\_changed\_3monthYes -0.018673 0.071421 -0.261 0.793801

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.9736 on 1104 degrees of freedom

(51 observations deleted due to missingness)

Multiple R-squared: 0.3329, Adjusted R-squared: 0.302

F-statistic: 10.8 on 51 and 1104 DF, p-value: < 2.2e-16

> Residuals <- residuals (lm)

> qqnorm(Residuals)

> shapiro.test (Residuals)

Shapiro-Wilk normality test

data: Residuals

W = 0.99718, p-value = 0.03878

> new\_cog\_no\_missing3$shape <- as.factor(new\_cog\_no\_missing3$shape)

> com=glht(lm,linfct=mcp(shape="Tukey")

+ )

> summary(com)

Simultaneous Tests for General Linear Hypotheses

Multiple Comparisons of Means: Tukey Contrasts

Fit: lm(formula = bcPower(DPQFAC3new, 1.51) ~ (age3 + sensory2 + height +

weight + breed + sex + neuter2 + offleash\_activity + shape +

food + Add\_vitamins + trauma + Health\_prob + medication +

Owner\_age + Age\_of\_dog\_when\_arrived + get\_dog + Where\_dog\_is\_kept +

dog\_jobs + play + commands + training + dog\_beh\_changed\_3month),

data = new\_cog\_no\_missing3, na.action = na.omit)

Linear Hypotheses:

Estimate Std. Error t value Pr(>|t|)

Normal - Thin == 0 -0.003058 0.081290 -0.038 0.99920

Overweight – Thin == 0 -0.264366 0.104303 -2.535 0.02967 \*

Overweight - Normal == 0 -0.261308 0.080657 -3.240 0.00359 \*\*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Adjusted p values reported -- single-step method)

#### Outliers removed (3 removed)

> lm<-lm(bcPower(DPQFAC3new,1.51)~(age+sensory+height+weight+breed+sex+neuter+offleash\_activity+BCS+food+Add\_vitamins+trauma+Health\_prob+medication+Owner\_age+Age\_of\_dog\_when\_arrived+get\_dog+Where\_dog\_is\_kept+dog\_obedience+play+commands+training+dog\_beh\_changed\_3month), data = data, na.action = na.omit)

> etasq(lm, anova = TRUE, type=3)

Anova Table (Type III tests)

Response: bcPower(DPQFAC3new, 1.51)

Partial eta^2 Sum Sq Df F value Pr(>F)

(Intercept) 0.221513 297.75 1 314.1355 < 2.2e-16 \*\*\*

age 0.075970 86.03 5 18.1532 < 2.2e-16 \*\*\*

sensory 0.005877 6.19 1 6.5261 0.010764 \*

height 0.000124 0.13 1 0.1372 0.711144

weight 0.000849 0.89 1 0.9380 0.332994

breed 0.003058 3.21 1 3.3866 0.065995 .

sex 0.003435 3.61 1 3.8057 0.051332 .

neuter 0.000000 0.00 1 0.0003 0.985089

offleash\_activity 0.007332 7.73 4 2.0386 0.086862 .

BCS 0.009736 10.29 2 5.4270 0.004514 \*\*

food 0.004888 5.14 4 1.3556 0.247383

Add\_vitamins 0.005239 5.51 3 1.9379 0.121693

trauma 0.001464 1.53 1 1.6190 0.203503

Health\_prob 0.004418 4.64 4 1.2248 0.298492

medication 0.001559 1.63 1 1.7237 0.189494

Owner\_age 0.002546 2.67 3 0.9394 0.420880

Age\_of\_dog\_when\_arrived 0.037211 40.44 3 14.2231 4.246e-09 \*\*\*

get\_dog 0.008879 9.37 2 4.9451 0.007277 \*\*

Where\_dog\_is\_kept 0.001926 2.02 2 1.0654 0.344936

dog\_obedience 0.033457 36.22 3 12.7383 3.460e-08 \*\*\*

play 0.005220 5.49 3 1.9309 0.122808

commands 0.006101 6.42 2 3.3884 0.034114 \*

training 0.002219 2.33 2 1.2278 0.293346

dog\_beh\_changed\_3month 0.000062 0.06 1 0.0684 0.793801

Residuals 1046.41 1104

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm)

Call:

lm(formula = bcPower(DPQFAC3new, 1.51) ~ (age + sensory + height +

weight + breed + sex + neuter + offleash\_activity + BCS +

food + Add\_vitamins + trauma + Health\_prob + medication +

Owner\_age + Age\_of\_dog\_when\_arrived + get\_dog + Where\_dog\_is\_kept +

dog\_obedience + play + commands + training + dog\_beh\_changed\_3month),

data = data, na.action = na.omit)

Residuals:

Min 1Q Median 3Q Max

-3.6446 -0.6414 0.0243 0.6305 3.4528

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 4.542784 0.256309 17.724 < 2e-16 \*\*\*

ageGroup2 -0.393857 0.101396 -3.884 0.000109 \*\*\*

ageGroup3 -0.660767 0.109066 -6.058 1.88e-09 \*\*\*

ageGroup4 -0.764156 0.113181 -6.752 2.36e-11 \*\*\*

ageGroup5 -0.918138 0.120399 -7.626 5.22e-14 \*\*\*

ageGroup6 -1.089676 0.128602 -8.473 < 2e-16 \*\*\*

sensoryPresent -0.240414 0.094110 -2.555 0.010764 \*

height -0.001074 0.002900 -0.370 0.711144

weight -0.003462 0.003574 -0.969 0.332994

breedPure 0.143972 0.078233 1.840 0.065995 .

sexMale 0.120257 0.061644 1.951 0.051332 .

neuterNeutered 0.001250 0.066842 0.019 0.985089

offleash\_activity30mins/1hour 0.025357 0.102956 -0.246 0.805507

offleash\_activity1/3 0.083642 0.099321 0.842 0.399890

offleash\_activity3/7 0.187261 0.116509 1.607 0.108281

offleash\_activity>7 0.223047 0.114449 1.949 0.051564 .

BCSNormal -0.003058 0.081290 -0.038 0.969998

BCSOverweight -0.264366 0.104303 -2.535 0.011395 \*

foodTinned and/or Dry food -0.161651 0.107939 -1.498 0.134519

foodCooked food -0.057153 0.087438 -0.654 0.513482

foodMixed -0.063948 0.090933 -0.703 0.482055

foodRaw -0.199051 0.097003 -2.052 0.040404 \*

Add\_vitaminsRarely -0.073105 0.077153 -0.948 0.343574

Add\_vitaminsOften 0.127625 0.088375 1.444 0.148985

Add\_vitaminsDaily 0.032663 0.092375 0.354 0.723711

traumaYes -0.084840 0.066678 -1.272 0.203503

Health\_probTooth problem only -0.027681 0.097928 -0.283 0.777486

Health\_probJoint & Tooth probs -0.238089 0.117014 -2.035 0.042120 \*

Health\_probJoint problems only -0.039292 0.089827 -0.437 0.661891

Health\_probOther disorders -0.098853 0.097549 -1.013 0.311106

medicationYes -0.115718 0.088140 -1.313 0.189494

Owner\_age30-39 -0.095092 0.077125 -1.233 0.217854

Owner\_age40-49 0.027330 0.083316 0.328 0.742951

Owner\_age>50 -0.068633 0.089133 -0.770 0.441457

Age\_of\_dog\_when\_arrived7-12w -0.208057 0.077713 -2.677 0.007533 \*\*

Age\_of\_dog\_when\_arrived3-12m -0.474382 0.099213 -4.781 1.98e-06 \*\*\*

Age\_of\_dog\_when\_arrived>1y -0.672949 0.109039 -6.172 9.48e-10 \*\*\*

get\_dogborn bought -0.329687 0.105449 -3.127 0.001815 \*\*

get\_dogpresent -0.173388 0.091738 -1.890 0.059016 .

Where\_dog\_is\_keptGarden -0.066171 0.104258 -0.635 0.525761

Where\_dog\_is\_keptApartment -0.135907 0.097188 -1.398 0.162276

dog\_obedience2 tasks 0.302246 0.114082 2.649 0.008179 \*\*

dog\_obedience3 tasks 0.321454 0.110164 2.918 0.003595 \*\*

dog\_obedience>3 tasks 0.617234 0.104827 5.888 5.18e-09 \*\*\*

play30m-1h 0.238903 0.106737 2.238 0.025405 \*

play1-3h 0.140138 0.108460 1.292 0.196604

play>3h 0.118006 0.132789 0.889 0.374373

commands11-30 0.088798 0.073600 1.206 0.227885

commands>30 0.307511 0.118197 2.602 0.009401 \*\*

training2-3 -0.080240 0.080328 -0.999 0.318062

training4 more 0.078302 0.092814 0.844 0.399051

dog\_beh\_changed\_3monthYes -0.018673 0.071421 -0.261 0.793801

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.9736 on 1104 degrees of freedom

(51 observations deleted due to missingness)

Multiple R-squared: 0.3329, Adjusted R-squared: 0.302

F-statistic: 10.8 on 51 and 1104 DF, p-value: < 2.2e-16

> Residuals <- residuals (lm)

> qqnorm(Residuals)

> shapiro.test (Residuals)

Shapiro-Wilk normality test

data: Residuals

W = 0.99718, p-value = 0.03878

### DPQFAC4 – Responsiveness to training

#### Age only

> lm<-lm(bcPower(DPQFAC4new,1.31)~(age), data = data, na.action = na.omit)

> etasq(lm, anova = TRUE, type=3)

Anova Table (Type III tests)

Response: bcPower(DPQFAC4new, 1.31)

Partial eta^2 Sum Sq Df F value Pr(>F)

(Intercept) 0.57052 2168.7 1 1563.555 < 2.2e-16 \*\*\*

age 0.04162 70.9 5 10.223 1.321e-09 \*\*\*

Residuals 1632.5 1177

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm)

Call:

lm(formula = bcPower(DPQFAC4new, 1.31) ~ (age), data = data,

na.action = na.omit)

Residuals:

Min 1Q Median 3Q Max

-3.5183 -0.8711 -0.0467 0.8838 2.6250

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 3.47106 0.08778 39.542 < 2e-16 \*\*\*

ageGroup2 0.11379 0.11572 0.983 0.3256

ageGroup3 0.07170 0.12281 0.584 0.5594

ageGroup4 0.04723 0.12100 0.390 0.6964

ageGroup5 -0.21869 0.12673 -1.726 0.0847 .

ageGroup6 -0.57332 0.12030 -4.766 2.12e-06 \*\*\*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1.178 on 1177 degrees of freedom

(24 observations deleted due to missingness)

Multiple R-squared: 0.04162, Adjusted R-squared: 0.03755

F-statistic: 10.22 on 5 and 1177 DF, p-value: 1.321e-09

> Residuals <- residuals (lm)

> qqnorm(Residuals)

> shapiro.test (Residuals)

Shapiro-Wilk normality test

data: Residuals

W = 0.98913, p-value = 1.104e-07

> data$age <- as.factor(data$age)

> com=glht(lm,linfct=mcp(age="Tukey"))

> summary(com)

Simultaneous Tests for General Linear Hypotheses

Multiple Comparisons of Means: Tukey Contrasts

Fit: lm(formula = bcPower(DPQFAC4new, 1.31) ~ (age), data = data,

na.action = na.omit)

Linear Hypotheses:

Estimate Std. Error t value Pr(>|t|)

Group2 - Group1 == 0 0.11379 0.11572 0.983 0.923

Group3 - Group1 == 0 0.07170 0.12281 0.584 0.992

Group4 - Group1 == 0 0.04723 0.12100 0.390 0.999

Group5 - Group1 == 0 -0.21869 0.12673 -1.726 0.514

Group6 - Group1 == 0 -0.57332 0.12030 -4.766 <0.001 \*\*\*

Group3 - Group2 == 0 -0.04209 0.11429 -0.368 0.999

Group4 - Group2 == 0 -0.06656 0.11234 -0.593 0.992

Group5 - Group2 == 0 -0.33248 0.11849 -2.806 0.057 .

Group6 - Group2 == 0 -0.68711 0.11158 -6.158 <0.001 \*\*\*

Group4 - Group3 == 0 -0.02447 0.11964 -0.205 1.000

Group5 - Group3 == 0 -0.29039 0.12543 -2.315 0.188

Group6 - Group3 == 0 -0.64503 0.11893 -5.424 <0.001 \*\*\*

Group5 - Group4 == 0 -0.26592 0.12366 -2.150 0.262

Group6 - Group4 == 0 -0.62055 0.11705 -5.302 <0.001 \*\*\*

Group6 - Group5 == 0 -0.35464 0.12297 -2.884 0.046 \*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Adjusted p values reported -- single-step method)

#### Full model

> lm<-lm(bcPower(DPQFAC4new,1.31)~(age+sensory+height+weight+breed+sex+neuter+offleash\_activity+BCS+food+Add\_vitamins+trauma+Health\_prob+medication+Owner\_age+Owner\_dog\_exp+How\_many\_dogs\_in\_house+How\_many\_people+Child+Age\_of\_dog\_when\_arrived+get\_dog+Where\_dog\_is\_kept+dog\_obedience+play+commands+training+Time\_dog\_spend\_alone+dog\_beh\_changed\_3month), data = data, na.action = na.omit)

> etasq(lm, anova = TRUE, type=3)

Anova Table (Type III tests)

Response: bcPower(DPQFAC4new, 1.31)

Partial eta^2 Sum Sq Df F value Pr(>F)

(Intercept) 0.042604 40.34 1 49.8402 2.920e-12 \*\*\*

age 0.004785 4.36 5 1.0770 0.371361

sensory 0.000791 0.72 1 0.8865 0.346622

height 0.001939 1.76 1 2.1760 0.140459

weight 0.006116 5.58 1 6.8926 0.008773 \*\*

breed 0.000288 0.26 1 0.3226 0.570187

sex 0.007822 7.15 1 8.8303 0.003026 \*\*

neuter 0.001126 1.02 1 1.2623 0.261455

offleash\_activity 0.013556 12.46 4 3.8478 0.004118 \*\*

BCS 0.000864 0.78 2 0.4845 0.616136

food 0.010953 10.04 4 3.1008 0.014956 \*

Add\_vitamins 0.003393 3.09 3 1.2709 0.282949

trauma 0.000915 0.83 1 1.0254 0.311470

Health\_prob 0.005212 4.75 4 1.4670 0.210002

medication 0.000001 0.00 1 0.0009 0.976203

Owner\_age 0.004400 4.01 3 1.6498 0.176184

Owner\_dog\_exp 0.005007 4.56 2 2.8182 0.060134 .

How\_many\_dogs\_in\_house 0.000145 0.13 2 0.0814 0.921816

How\_many\_people 0.003572 3.25 3 1.3383 0.260445

Child 0.001095 0.99 1 1.2272 0.268191

Age\_of\_dog\_when\_arrived 0.001758 1.60 3 0.6575 0.578302

get\_dog 0.000028 0.03 2 0.0156 0.984474

Where\_dog\_is\_kept 0.003041 2.76 2 1.7079 0.181719

dog\_obedience 0.184699 205.38 3 84.5755 < 2.2e-16 \*\*\*

play 0.012640 11.61 3 4.7793 0.002580 \*\*

commands 0.031105 29.10 2 17.9781 2.065e-08 \*\*\*

training 0.006030 5.50 2 3.3973 0.033810 \*

Time\_dog\_spend\_alone 0.006202 5.66 3 2.3299 0.072830 .

dog\_beh\_changed\_3month 0.004408 4.01 1 4.9587 0.026158 \*

Residuals 906.58 1120

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm)

Call:

lm(formula = bcPower(DPQFAC4new, 1.31) ~ (age + sensory + height +

weight + breed + sex + neuter + offleash\_activity + BCS +

food + Add\_vitamins + trauma + Health\_prob + medication +

Owner\_age + Owner\_dog\_exp + How\_many\_dogs\_in\_house + How\_many\_people +

Child + Age\_of\_dog\_when\_arrived + get\_dog + Where\_dog\_is\_kept +

dog\_obedience + play + commands + training + Time\_dog\_spend\_alone +

dog\_beh\_changed\_3month), data = data, na.action = na.omit)

Residuals:

Min 1Q Median 3Q Max

-2.65335 -0.57800 0.00286 0.61839 3.04808

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 1.908e+00 2.703e-01 7.060 2.92e-12 \*\*\*

ageGroup2 1.255e-01 9.343e-02 1.343 0.179417

ageGroup3 7.574e-02 9.990e-02 0.758 0.448503

ageGroup4 1.678e-01 1.033e-01 1.623 0.104801

ageGroup5 4.242e-02 1.104e-01 0.384 0.700715

ageGroup6 -1.957e-02 1.181e-01 -0.166 0.868484

sensoryPresent 8.129e-02 8.634e-02 0.942 0.346622

height -3.939e-03 2.670e-03 -1.475 0.140459

weight 8.697e-03 3.313e-03 2.625 0.008773 \*\*

breedPure -4.085e-02 7.192e-02 -0.568 0.570187

sexMale -1.681e-01 5.656e-02 -2.972 0.003026 \*\*

neuterNeutered -6.841e-02 6.089e-02 -1.124 0.261455

offleash\_activity30mins/1hour 1.282e-01 9.379e-02 1.367 0.172028

offleash\_activity1/3 3.118e-01 9.082e-02 3.434 0.000617 \*\*\*

offleash\_activity3/7 3.161e-01 1.081e-01 2.924 0.003530 \*\*

offleash\_activity>7 2.161e-01 1.058e-01 2.042 0.041378 \*

BCSNormal 3.073e-02 7.507e-02 0.409 0.682362

BCSOverweight 9.116e-02 9.639e-02 0.946 0.344486

foodTinned and/or Dry food 3.841e-02 9.826e-02 0.391 0.695932

foodCooked food 9.357e-02 7.995e-02 1.170 0.242089

foodMixed -1.269e-01 8.459e-02 -1.500 0.133844

foodRaw 1.616e-01 8.894e-02 1.817 0.069485 .

Add\_vitaminsRarely 1.131e-02 7.117e-02 0.159 0.873766

Add\_vitaminsOften -6.071e-02 8.146e-02 -0.745 0.456223

Add\_vitaminsDaily 1.058e-01 8.505e-02 1.244 0.213698

traumaYes -6.134e-02 6.058e-02 -1.013 0.311470

Health\_probTooth problem only -1.924e-01 9.028e-02 -2.131 0.033290 \*

Health\_probJoint & Tooth probs -1.968e-01 1.072e-01 -1.836 0.066606 .

Health\_probJoint problems only -1.097e-01 8.201e-02 -1.338 0.181117

Health\_probOther disorders -1.042e-01 8.874e-02 -1.174 0.240798

medicationYes -2.419e-03 8.107e-02 -0.030 0.976203

Owner\_age30-39 -1.749e-02 7.627e-02 -0.229 0.818635

Owner\_age40-49 4.678e-02 8.508e-02 0.550 0.582587

Owner\_age>50 -1.444e-01 9.029e-02 -1.599 0.110057

Owner\_dog\_expHad a dog before -1.119e-01 7.026e-02 -1.593 0.111499

Owner\_dog\_expNever had a dog -2.008e-01 8.485e-02 -2.366 0.018145 \*

How\_many\_dogs\_in\_houseOne -2.430e-02 6.234e-02 -0.390 0.696755

How\_many\_dogs\_in\_houseTwo more -2.067e-02 7.570e-02 -0.273 0.784891

How\_many\_peopleTwo people 1.318e-01 9.124e-02 1.444 0.149008

How\_many\_peopleThree people 1.923e-02 1.102e-01 0.175 0.861493

How\_many\_peopleFour more 1.074e-02 1.133e-01 0.095 0.924520

ChildYes 8.970e-02 8.097e-02 1.108 0.268191

Age\_of\_dog\_when\_arrived7-12w 1.879e-02 7.131e-02 0.264 0.792189

Age\_of\_dog\_when\_arrived3-12m -5.933e-02 9.079e-02 -0.653 0.513590

Age\_of\_dog\_when\_arrived>1y 7.012e-02 1.003e-01 0.699 0.484460

get\_dogborn bought 5.567e-05 9.716e-02 0.001 0.999543

get\_dogpresent -1.089e-02 8.467e-02 -0.129 0.897725

Where\_dog\_is\_keptGarden 1.008e-01 9.499e-02 1.061 0.288988

Where\_dog\_is\_keptApartment 1.627e-01 8.865e-02 1.835 0.066736 .

dog\_obedience2 tasks 2.488e-01 1.049e-01 2.371 0.017896 \*

dog\_obedience3 tasks 6.752e-01 1.007e-01 6.708 3.13e-11 \*\*\*

dog\_obedience>3 tasks 1.332e+00 9.643e-02 13.812 < 2e-16 \*\*\*

play30m-1h 1.912e-01 9.889e-02 1.934 0.053415 .

play1-3h 3.097e-01 1.007e-01 3.074 0.002160 \*\*

play>3h 4.257e-01 1.218e-01 3.494 0.000495 \*\*\*

commands11-30 2.983e-01 6.780e-02 4.399 1.19e-05 \*\*\*

commands>30 6.269e-01 1.095e-01 5.726 1.32e-08 \*\*\*

training2-3 1.744e-01 7.404e-02 2.355 0.018671 \*

training4 more 1.521e-01 8.563e-02 1.777 0.075900 .

Time\_dog\_spend\_alone1-2h -2.139e-01 9.249e-02 -2.313 0.020897 \*

Time\_dog\_spend\_alone3-8h -5.986e-02 8.332e-02 -0.718 0.472609

Time\_dog\_spend\_alone>8h -6.669e-02 1.063e-01 -0.627 0.530718

dog\_beh\_changed\_3monthYes -1.453e-01 6.525e-02 -2.227 0.026158 \*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.8997 on 1120 degrees of freedom

(27 observations deleted due to missingness)

Multiple R-squared: 0.4678, Adjusted R-squared: 0.4383

F-statistic: 15.88 on 62 and 1120 DF, p-value: < 2.2e-16

> Residuals <- residuals (lm)

> qqnorm(Residuals)

> shapiro.test (Residuals)

Shapiro-Wilk normality test

data: Residuals

W = 0.99863, p-value = 0.4932

#### Reduced Model

> lm<-lm(bcPower(DPQFAC4new,1.31)~(age+sensory+height+weight+breed+sex+neuter+offleash\_activity+BCS+food+Add\_vitamins+trauma+Health\_prob+medication+Owner\_age+Age\_of\_dog\_when\_arrived+get\_dog+Where\_dog\_is\_kept+dog\_obedience+play+commands+training+dog\_beh\_changed\_3month), data = data, na.action = na.omit)

> etasq(lm, anova = TRUE, type=3)

Anova Table (Type III tests)

Response: bcPower(DPQFAC4new, 1.31)

Partial eta^2 Sum Sq Df F value Pr(>F)

(Intercept) 0.048879 47.34 1 58.1229 5.197e-14 \*\*\*

age 0.004736 4.38 5 1.0765 0.371646

sensory 0.001339 1.23 1 1.5162 0.218448

height 0.001848 1.71 1 2.0943 0.148125

weight 0.006185 5.73 1 7.0392 0.008086 \*\*

breed 0.000210 0.19 1 0.2377 0.625940

sex 0.009054 8.42 1 10.3338 0.001343 \*\*

neuter 0.000877 0.81 1 0.9925 0.319340

offleash\_activity 0.013510 12.62 4 3.8723 0.003944 \*\*

BCS 0.000680 0.63 2 0.3850 0.680555

food 0.010357 9.64 4 2.9591 0.019023 \*

Add\_vitamins 0.003773 3.49 3 1.4277 0.233082

trauma 0.000711 0.66 1 0.8051 0.369750

Health\_prob 0.005749 5.33 4 1.6349 0.163137

medication 0.000142 0.13 1 0.1611 0.688265

Owner\_age 0.003962 3.66 3 1.4995 0.213041

Age\_of\_dog\_when\_arrived 0.001902 1.76 3 0.7185 0.541000

get\_dog 0.000051 0.05 2 0.0286 0.971833

Where\_dog\_is\_kept 0.002459 2.27 2 1.3940 0.248497

dog\_obedience 0.181872 204.78 3 83.8079 < 2.2e-16 \*\*\*

play 0.011035 10.28 3 4.2065 0.005704 \*\*

commands 0.034095 32.52 2 19.9613 3.023e-09 \*\*\*

training 0.007136 6.62 2 4.0644 0.017424 \*

dog\_beh\_changed\_3month 0.004424 4.09 1 5.0253 0.025173 \*

Residuals 921.19 1131

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm)

Call:

lm(formula = bcPower(DPQFAC4new, 1.31) ~ (age + sensory + height +

weight + breed + sex + neuter + offleash\_activity + BCS +

food + Add\_vitamins + trauma + Health\_prob + medication +

Owner\_age + Age\_of\_dog\_when\_arrived + get\_dog + Where\_dog\_is\_kept +

dog\_obedience + play + commands + training + dog\_beh\_changed\_3month),

data = data, na.action = na.omit)

Residuals:

Min 1Q Median 3Q Max

-2.71396 -0.59663 0.02132 0.63222 2.99536

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 1.778480 0.233279 7.624 5.20e-14 \*\*\*

ageGroup2 0.128956 0.093182 1.384 0.166658

ageGroup3 0.063353 0.099979 0.634 0.526433

ageGroup4 0.156507 0.102800 1.522 0.128176

ageGroup5 0.033894 0.109976 0.308 0.757991

ageGroup6 -0.027964 0.117731 -0.238 0.812290

sensoryPresent 0.106183 0.086233 1.231 0.218448

height -0.003849 0.002660 -1.447 0.148125

weight 0.008758 0.003301 2.653 0.008086 \*\*

breedPure -0.035025 0.071834 -0.488 0.625940

sexMale -0.181032 0.056315 -3.215 0.001343 \*\*

neuterNeutered -0.060569 0.060797 -0.996 0.319340

offleash\_activity30mins/1hour 0.134600 0.093490 1.440 0.150224

offleash\_activity1/3 0.315998 0.090758 3.482 0.000517 \*\*\*

offleash\_activity3/7 0.314703 0.107189 2.936 0.003392 \*\*

offleash\_activity>7 0.220245 0.105528 2.087 0.037105 \*

BCSNormal 0.018015 0.074396 0.242 0.808703

BCSOverweight 0.076517 0.095691 0.800 0.424095

foodTinned and/or Dry food 0.020718 0.097590 0.212 0.831911

foodCooked food 0.078226 0.079163 0.988 0.323281

foodMixed -0.115570 0.083332 -1.387 0.165758

foodRaw 0.174438 0.088703 1.967 0.049481 \*

Add\_vitaminsRarely 0.027505 0.070819 0.388 0.697808

Add\_vitaminsOften -0.043975 0.080777 -0.544 0.586271

Add\_vitaminsDaily 0.127648 0.084307 1.514 0.130286

traumaYes -0.054225 0.060431 -0.897 0.369750

Health\_probTooth problem only -0.202190 0.089949 -2.248 0.024779 \*

Health\_probJoint & Tooth probs -0.203276 0.106903 -1.902 0.057490 .

Health\_probJoint problems only -0.125535 0.081755 -1.535 0.124942

Health\_probOther disorders -0.119774 0.088311 -1.356 0.175284

medicationYes -0.032388 0.080704 -0.401 0.688265

Owner\_age30-39 0.034133 0.070548 0.484 0.628607

Owner\_age40-49 0.066558 0.076195 0.874 0.382559

Owner\_age>50 -0.106449 0.081733 -1.302 0.193045

Age\_of\_dog\_when\_arrived7-12w 0.007316 0.070830 0.103 0.917748

Age\_of\_dog\_when\_arrived3-12m -0.064252 0.090694 -0.708 0.478813

Age\_of\_dog\_when\_arrived>1y 0.075584 0.100331 0.753 0.451398

get\_dogborn bought 0.008089 0.096717 0.084 0.933363

get\_dogpresent -0.008932 0.084295 -0.106 0.915633

Where\_dog\_is\_keptGarden 0.095543 0.094660 1.009 0.313033

Where\_dog\_is\_keptApartment 0.146348 0.087947 1.664 0.096381 .

dog\_obedience2 tasks 0.250568 0.104591 2.396 0.016750 \*

dog\_obedience3 tasks 0.665136 0.100381 6.626 5.32e-11 \*\*\*

dog\_obedience>3 tasks 1.326076 0.096233 13.780 < 2e-16 \*\*\*

play30m-1h 0.181654 0.098722 1.840 0.066021 .

play1-3h 0.286563 0.100398 2.854 0.004393 \*\*

play>3h 0.402052 0.121260 3.316 0.000943 \*\*\*

commands11-30 0.308254 0.067541 4.564 5.57e-06 \*\*\*

commands>30 0.656564 0.108383 6.058 1.88e-09 \*\*\*

training2-3 0.187175 0.073875 2.534 0.011422 \*

training4 more 0.172144 0.085302 2.018 0.043821 \*

dog\_beh\_changed\_3monthYes -0.146095 0.065171 -2.242 0.025173 \*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.9025 on 1131 degrees of freedom

(27 observations deleted due to missingness)

Multiple R-squared: 0.4592, Adjusted R-squared: 0.4348

F-statistic: 18.83 on 51 and 1131 DF, p-value: < 2.2e-16

> Residuals <- residuals (lm)

> qqnorm(Residuals)

> shapiro.test (Residuals)

Shapiro-Wilk normality test

data: Residuals

W = 0.99917, p-value = 0.8927

#### Outliers removed (1 removed)

#### Mediation Analysis

> A <- polr(play ~ age+sensory+height+weight+breed+sex+neuter+offleash\_activity+BCS+food+Add\_vitamins+trauma+Health\_prob+medication+Owner\_age+Age\_of\_dog\_when\_arrived+get\_dog+Where\_dog\_is\_kept+commands+dog\_obedience+training+dog\_beh\_changed\_3month , data=new\_cog\_no\_missing\_new, na.action = na.omit,method = "probit", Hess = TRUE)

> B <- lm(bcPower(DPQFAC4new,1.31)~(play+age+sensory+height+weight+breed+sex+neuter+offleash\_activity+BCS+food+Add\_vitamins+trauma+Health\_prob+medication+Owner\_age+Age\_of\_dog\_when\_arrived+get\_dog+Where\_dog\_is\_kept+dog\_obedience+commands+training+dog\_beh\_changed\_3month), data=new\_cog\_no\_missing\_new, na.action = na.omit)

> Mediation <- mediate(A,B, treat="age", mediator="play", ,control.value = "Group2", treat.value = "Group6", robustSE = TRUE, sims = 100, data=data)

> summary(Mediation)

Causal Mediation Analysis

Quasi-Bayesian Confidence Intervals

Estimate 95% CI Lower 95% CI Upper p-value

ACME -0.0365 -0.0678 -0.01 <2e-16 \*\*\*

ADE -0.1365 -0.3147 0.10 0.16

Total Effect -0.1729 -0.3639 0.07 0.12

Prop. Mediated 0.1766 -0.5282 0.84 0.12

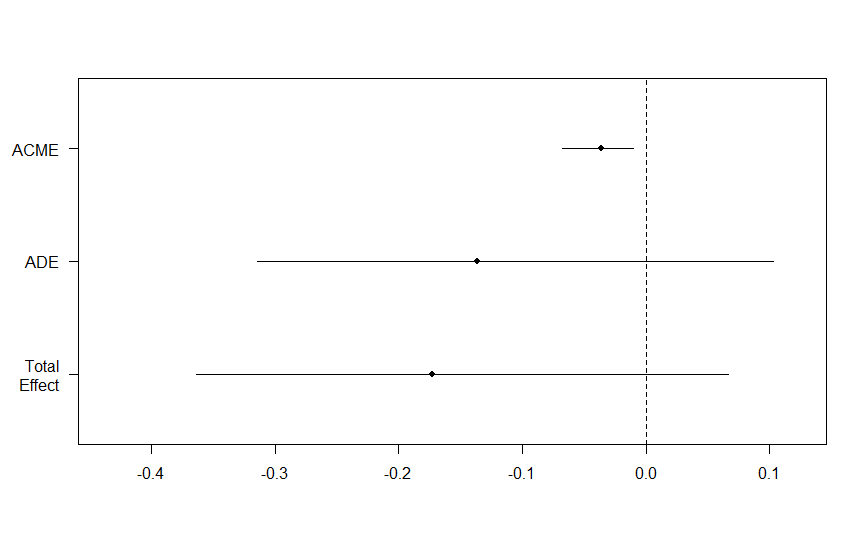
---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Sample Size Used: 1183

Simulations: 100

> plot(Mediation)



**Figure 2. Estimates (points) and 95% confidence intervals for the average causal mediation effect (ACME), average direct effect (ADE), and total effect.**

When comparing age group two and group six (adult vs old dogs), result indicate that there was a significant average causal mediation effect (ACME), but the estimated average direct effect and the total effect was not significant. The results suggest that the change in the play variable (mediator) in older dogs in part drove the lower Responsiveness to training personality trait score, as it explained the relationship better than the age of the dog (direct effect) in itself. The average proportion mediated was 18%.

### DPQFAC5 – Aggressiveness to animals

#### Age only

> lm<-lm(bcPower(DPQFAC5new,0.46)~(age), data = data, na.action = na.omit)

> etasq(lm, anova = TRUE, type=3)

Anova Table (Type III tests)

Response: bcPower(DPQFAC5new, 0.46)

Partial eta^2 Sum Sq Df F value Pr(>F)

(Intercept) 0.50765 242.195 1 1201.1953 < 2.2e-16 \*\*\*

age 0.01948 4.666 5 4.6284 0.0003459 \*\*\*

Residuals 234.897 1165

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm)

Call:

lm(formula = bcPower(DPQFAC5new, 0.46) ~ (age), data = data,

na.action = na.omit)

Residuals:

Min 1Q Median 3Q Max

-1.30880 -0.31826 -0.00171 0.32050 1.18772

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 1.16976 0.03375 34.658 < 2e-16 \*\*\*

ageGroup2 0.01667 0.04433 0.376 0.70696

ageGroup3 0.13627 0.04728 2.883 0.00402 \*\*

ageGroup4 0.13904 0.04645 2.993 0.00282 \*\*

ageGroup5 0.04012 0.04852 0.827 0.40841

ageGroup6 -0.02028 0.04623 -0.439 0.66104

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.449 on 1165 degrees of freedom

(36 observations deleted due to missingness)

Multiple R-squared: 0.01948, Adjusted R-squared: 0.01527

F-statistic: 4.628 on 5 and 1165 DF, p-value: 0.0003459

> Residuals <- residuals (lm)

> qqnorm(Residuals)

> shapiro.test (Residuals)

Shapiro-Wilk normality test

data: Residuals

W = 0.9968, p-value = 0.01739

> com=glht(lm,linfct=mcp(age="Tukey"))

> summary(com)

Simultaneous Tests for General Linear Hypotheses

Multiple Comparisons of Means: Tukey Contrasts

Fit: lm(formula = bcPower(DPQFAC5new, 0.46) ~ (age), data = data,

na.action = na.omit)

Linear Hypotheses:

Estimate Std. Error t value Pr(>|t|)

Group2 - Group1 == 0 0.016671 0.044334 0.376 0.99902

Group3 - Group1 == 0 0.136271 0.047275 2.883 0.04599 \*

Group4 - Group1 == 0 0.139037 0.046449 2.993 0.03338 \*

Group5 - Group1 == 0 0.040122 0.048516 0.827 0.96244

Group6 - Group1 == 0 -0.020277 0.046231 -0.439 0.99794

Group3 - Group2 == 0 0.119600 0.043842 2.728 0.07037 .

Group4 - Group2 == 0 0.122366 0.042950 2.849 0.05056 .

Group5 - Group2 == 0 0.023451 0.045177 0.519 0.99542

Group6 - Group2 == 0 -0.036948 0.042714 -0.865 0.95455

Group4 - Group3 == 0 0.002766 0.045980 0.060 1.00000

Group5 - Group3 == 0 -0.096149 0.048067 -2.000 0.34201

Group6 - Group3 == 0 -0.156548 0.045760 -3.421 0.00838 \*\*

Group5 - Group4 == 0 -0.098915 0.047254 -2.093 0.29083

Group6 - Group4 == 0 -0.159314 0.044905 -3.548 0.00541 \*\*

Group6 - Group5 == 0 -0.060399 0.047040 -1.284 0.79340

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Adjusted p values reported -- single-step method)

#### Full Model

> lm<-lm(bcPower(DPQFAC5new,0.46)~(age+sensory+height+weight+breed+sex+neuter+offleash\_activity+BCS+food+Add\_vitamins+trauma+Health\_prob+medication+Owner\_age+Owner\_dog\_exp+How\_many\_dogs\_in\_house+How\_many\_people+Child+Age\_of\_dog\_when\_arrived+get\_dog+Where\_dog\_is\_kept+dog\_obedience+play+commands+training+Time\_dog\_spend\_alone+dog\_beh\_changed\_3month), data = data, na.action = na.omit)

> etasq(lm, anova = TRUE, type=3)

Anova Table (Type III tests)

Response: bcPower(DPQFAC5new, 0.46)

Partial eta^2 Sum Sq Df F value Pr(>F)

(Intercept) 0.090987 21.048 1 110.9038 < 2.2e-16 \*\*\*

age 0.018420 3.946 5 4.1584 0.0009525 \*\*\*

sensory 0.005018 1.060 1 5.5875 0.0182604 \*

height 0.001418 0.299 1 1.5735 0.2099614

weight 0.001579 0.333 1 1.7525 0.1858356

breed 0.005218 1.103 1 5.8118 0.0160813 \*

sex 0.002190 0.462 1 2.4323 0.1191418

neuter 0.002981 0.629 1 3.3129 0.0690098 .

offleash\_activity 0.006275 1.328 4 1.7492 0.1368848

BCS 0.003027 0.638 2 1.6822 0.1864470

food 0.012712 2.707 4 3.5665 0.0067197 \*\*

Add\_vitamins 0.001808 0.381 3 0.6690 0.5711499

trauma 0.007208 1.527 1 8.0447 0.0046468 \*\*

Health\_prob 0.007521 1.594 4 2.0991 0.0788526 .

medication 0.000037 0.008 1 0.0414 0.8388949

Owner\_age 0.000442 0.093 3 0.1634 0.9210305

Owner\_dog\_exp 0.003252 0.686 2 1.8076 0.1645372

How\_many\_dogs\_in\_house 0.000262 0.055 2 0.1453 0.8647575

How\_many\_people 0.002964 0.625 3 1.0979 0.3489864

Child 0.000093 0.019 1 0.1026 0.7487404

Age\_of\_dog\_when\_arrived 0.009424 2.000 3 3.5135 0.0147911 \*

get\_dog 0.000108 0.023 2 0.0598 0.9420009

Where\_dog\_is\_kept 0.004675 0.988 2 2.6021 0.0745714 .

dog\_obedience 0.019678 4.221 3 7.4135 6.429e-05 \*\*\*

play 0.000715 0.150 3 0.2643 0.8511409

commands 0.001349 0.284 2 0.7482 0.4734542

training 0.000701 0.147 2 0.3884 0.6782509

Time\_dog\_spend\_alone 0.000315 0.066 3 0.1162 0.9506192

dog\_beh\_changed\_3month 0.002784 0.587 1 3.0932 0.0788946 .

Residuals 210.282 1108

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm)

Call:

lm(formula = bcPower(DPQFAC5new, 0.46) ~ (age + sensory + height +

weight + breed + sex + neuter + offleash\_activity + BCS +

food + Add\_vitamins + trauma + Health\_prob + medication +

Owner\_age + Owner\_dog\_exp + How\_many\_dogs\_in\_house + How\_many\_people +

Child + Age\_of\_dog\_when\_arrived + get\_dog + Where\_dog\_is\_kept +

dog\_obedience + play + commands + training + Time\_dog\_spend\_alone +

dog\_beh\_changed\_3month), data = data, na.action = na.omit)

Residuals:

Min 1Q Median 3Q Max

-1.20798 -0.29223 0.00088 0.30067 1.16770

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 1.3837036 0.1313923 10.531 < 2e-16 \*\*\*

ageGroup2 0.0233984 0.0453945 0.515 0.60634

ageGroup3 0.1297475 0.0488956 2.654 0.00808 \*\*

ageGroup4 0.1190091 0.0503388 2.364 0.01824 \*

ageGroup5 0.0261860 0.0537732 0.487 0.62638

ageGroup6 -0.0573886 0.0578182 -0.993 0.32114

sensoryPresent -0.0990558 0.0419053 -2.364 0.01826 \*

height -0.0016337 0.0013024 -1.254 0.20996

weight 0.0021307 0.0016095 1.324 0.18584

breedPure -0.0847358 0.0351490 -2.411 0.01608 \*

sexMale 0.0429217 0.0275211 1.560 0.11914

neuterNeutered -0.0540700 0.0297068 -1.820 0.06901 .

offleash\_activity30mins/1hour -0.0379077 0.0457899 -0.828 0.40793

offleash\_activity1/3 -0.1079415 0.0444519 -2.428 0.01533 \*

offleash\_activity3/7 -0.0576964 0.0526828 -1.095 0.27368

offleash\_activity>7 -0.0638412 0.0514923 -1.240 0.21530

BCSNormal -0.0272441 0.0366874 -0.743 0.45788

BCSOverweight -0.0823372 0.0469561 -1.753 0.07979 .

foodTinned and/or Dry food -0.1051971 0.0476484 -2.208 0.02746 \*

foodCooked food 0.0281214 0.0390522 0.720 0.47162

foodMixed 0.0651751 0.0412314 1.581 0.11423

foodRaw 0.0391445 0.0431708 0.907 0.36474

Add\_vitaminsRarely -0.0433078 0.0347075 -1.248 0.21237

Add\_vitaminsOften -0.0215622 0.0396395 -0.544 0.58658

Add\_vitaminsDaily -0.0007903 0.0413517 -0.019 0.98476

traumaYes 0.0835928 0.0294723 2.836 0.00465 \*\*

Health\_probTooth problem only 0.1221577 0.0441015 2.770 0.00570 \*\*

Health\_probJoint & Tooth probs 0.0567985 0.0522646 1.087 0.27738

Health\_probJoint problems only 0.0631386 0.0399910 1.579 0.11466

Health\_probOther disorders 0.0724829 0.0431997 1.678 0.09366 .

medicationYes -0.0080155 0.0394162 -0.203 0.83889

Owner\_age30-39 0.0126925 0.0371572 0.342 0.73272

Owner\_age40-49 0.0145717 0.0414156 0.352 0.72503

Owner\_age>50 0.0305313 0.0436255 0.700 0.48417

Owner\_dog\_expHad a dog before -0.0253641 0.0345066 -0.735 0.46246

Owner\_dog\_expNever had a dog 0.0384646 0.0414810 0.927 0.35398

How\_many\_dogs\_in\_houseOne 0.0151077 0.0302980 0.499 0.61814

How\_many\_dogs\_in\_houseTwo more 0.0017166 0.0368805 0.047 0.96289

How\_many\_peopleTwo people 0.0008694 0.0439407 0.020 0.98422

How\_many\_peopleThree people -0.0377085 0.0535342 -0.704 0.48134

How\_many\_peopleFour more 0.0318051 0.0546221 0.582 0.56050

ChildYes 0.0126040 0.0393406 0.320 0.74874

Age\_of\_dog\_when\_arrived7-12w 0.0708828 0.0347013 2.043 0.04132 \*

Age\_of\_dog\_when\_arrived3-12m 0.0369878 0.0442849 0.835 0.40377

Age\_of\_dog\_when\_arrived>1y -0.0652826 0.0485622 -1.344 0.17912

get\_dogborn bought 0.0003251 0.0472103 0.007 0.99451

get\_dogpresent 0.0105984 0.0410075 0.258 0.79611

Where\_dog\_is\_keptGarden -0.0277291 0.0464701 -0.597 0.55082

Where\_dog\_is\_keptApartment -0.0881388 0.0433433 -2.034 0.04224 \*

dog\_obedience2 tasks 0.0566546 0.0512542 1.105 0.26924

dog\_obedience3 tasks -0.0582131 0.0490294 -1.187 0.23536

dog\_obedience>3 tasks -0.1391010 0.0468529 -2.969 0.00305 \*\*

play30m-1h 0.0029871 0.0480561 0.062 0.95045

play1-3h -0.0151375 0.0489364 -0.309 0.75713

play>3h 0.0183506 0.0592464 0.310 0.75682

commands11-30 0.0380506 0.0329372 1.155 0.24824

commands>30 0.0494048 0.0534102 0.925 0.35516

training2-3 -0.0131831 0.0360419 -0.366 0.71461

training4 more 0.0269726 0.0416556 0.648 0.51743

Time\_dog\_spend\_alone1-2h -0.0112622 0.0449551 -0.251 0.80223

Time\_dog\_spend\_alone3-8h -0.0177099 0.0404807 -0.437 0.66184

Time\_dog\_spend\_alone>8h -0.0290259 0.0518037 -0.560 0.57538

dog\_beh\_changed\_3monthYes 0.0559552 0.0318152 1.759 0.07889 .

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.4356 on 1108 degrees of freedom

(36 observations deleted due to missingness)

Multiple R-squared: 0.1222, Adjusted R-squared: 0.07311

F-statistic: 2.488 on 62 and 1108 DF, p-value: 4.968e-09

> Residuals <- residuals (lm)

> qqnorm(Residuals)

> shapiro.test (Residuals)

Shapiro-Wilk normality test

data: Residuals

W = 0.99801, p-value = 0.1773

#### Reduced Model

> lm<-lm(bcPower(DPQFAC5new,0.46)~(age+sensory+height+weight+breed+sex+neuter+offleash\_activity+BCS+food+Add\_vitamins+trauma+Health\_prob+medication+Owner\_age+Age\_of\_dog\_when\_arrived+get\_dog+Where\_dog\_is\_kept+dog\_obedience+play+commands+training+dog\_beh\_changed\_3month), data = data, na.action = na.omit)

> etasq(lm, anova = TRUE, type=3)

Anova Table (Type III tests)

Response: bcPower(DPQFAC5new, 0.46)

Partial eta^2 Sum Sq Df F value Pr(>F)

(Intercept) 0.115071 27.533 1 145.5086 < 2.2e-16 \*\*\*

age 0.018045 3.891 5 4.1128 0.001049 \*\*

sensory 0.005304 1.129 1 5.9671 0.014729 \*

height 0.001130 0.240 1 1.2661 0.260745

weight 0.001349 0.286 1 1.5121 0.219078

breed 0.005192 1.105 1 5.8406 0.015819 \*

sex 0.002442 0.518 1 2.7392 0.098195 .

neuter 0.002731 0.580 1 3.0646 0.080287 .

offleash\_activity 0.006625 1.412 4 1.8656 0.114198

BCS 0.003297 0.700 2 1.8511 0.157553

food 0.012159 2.606 4 3.4434 0.008310 \*\*

Add\_vitamins 0.001976 0.419 3 0.7385 0.529144

trauma 0.007541 1.609 1 8.5021 0.003618 \*\*

Health\_prob 0.007277 1.552 4 2.0506 0.085210 .

medication 0.000056 0.012 1 0.0626 0.802451

Owner\_age 0.000284 0.060 3 0.1061 0.956535

Age\_of\_dog\_when\_arrived 0.008570 1.830 3 3.2241 0.021937 \*

get\_dog 0.000124 0.026 2 0.0692 0.933166

Where\_dog\_is\_kept 0.004534 0.964 2 2.5484 0.078660 .

dog\_obedience 0.019132 4.130 3 7.2753 7.804e-05 \*\*\*

play 0.000665 0.141 3 0.2483 0.862590

commands 0.001429 0.303 2 0.8009 0.449188

training 0.000728 0.154 2 0.4076 0.665351

dog\_beh\_changed\_3month 0.002647 0.562 1 2.9701 0.085091 .

Residuals 211.733 1119

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm)

Call:

lm(formula = bcPower(DPQFAC5new, 0.46) ~ (age + sensory + height +

weight + breed + sex + neuter + offleash\_activity + BCS +

food + Add\_vitamins + trauma + Health\_prob + medication +

Owner\_age + Age\_of\_dog\_when\_arrived + get\_dog + Where\_dog\_is\_kept +

dog\_obedience + play + commands + training + dog\_beh\_changed\_3month),

data = data, na.action = na.omit)

Residuals:

Min 1Q Median 3Q Max

-1.24056 -0.29913 0.00567 0.30524 1.20418

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 1.3649496 0.1131546 12.063 < 2e-16 \*\*\*

ageGroup2 0.0202406 0.0450659 0.449 0.65342

ageGroup3 0.1258523 0.0486749 2.586 0.00985 \*\*

ageGroup4 0.1193266 0.0498895 2.392 0.01693 \*

ageGroup5 0.0257987 0.0532958 0.484 0.62843

ageGroup6 -0.0565072 0.0573645 -0.985 0.32481

sensoryPresent -0.1018116 0.0416789 -2.443 0.01473 \*

height -0.0014544 0.0012926 -1.125 0.26074

weight 0.0019658 0.0015987 1.230 0.21908

breedPure -0.0844225 0.0349323 -2.417 0.01582 \*

sexMale 0.0451027 0.0272516 1.655 0.09820 .

neuterNeutered -0.0516750 0.0295183 -1.751 0.08029 .

offleash\_activity30mins/1hour -0.0333523 0.0454669 -0.734 0.46338

offleash\_activity1/3 -0.1075649 0.0441986 -2.434 0.01510 \*

offleash\_activity3/7 -0.0474561 0.0520684 -0.911 0.36227

offleash\_activity>7 -0.0643359 0.0511399 -1.258 0.20864

BCSNormal -0.0331552 0.0361798 -0.916 0.35966

BCSOverweight -0.0872588 0.0463783 -1.881 0.06017 .

foodTinned and/or Dry food -0.1046577 0.0471236 -2.221 0.02656 \*

foodCooked food 0.0254849 0.0384979 0.662 0.50812

foodMixed 0.0615511 0.0404096 1.523 0.12800

foodRaw 0.0381196 0.0428538 0.890 0.37391

Add\_vitaminsRarely -0.0446769 0.0343339 -1.301 0.19344

Add\_vitaminsOften -0.0245025 0.0390993 -0.627 0.53100

Add\_vitaminsDaily -0.0001864 0.0408067 -0.005 0.99636

traumaYes 0.0852561 0.0292389 2.916 0.00362 \*\*

Health\_probTooth problem only 0.1181565 0.0437415 2.701 0.00701 \*\*

Health\_probJoint & Tooth probs 0.0587334 0.0518558 1.133 0.25761

Health\_probJoint problems only 0.0648310 0.0397103 1.633 0.10283

Health\_probOther disorders 0.0747003 0.0427926 1.746 0.08115 .

medicationYes -0.0097669 0.0390307 -0.250 0.80245

Owner\_age30-39 0.0063459 0.0342349 0.185 0.85298

Owner\_age40-49 0.0119820 0.0371720 0.322 0.74726

Owner\_age>50 0.0214319 0.0393183 0.545 0.58580

Age\_of\_dog\_when\_arrived7-12w 0.0610645 0.0343211 1.779 0.07548 .

Age\_of\_dog\_when\_arrived3-12m 0.0328991 0.0440508 0.747 0.45531

Age\_of\_dog\_when\_arrived>1y -0.0705237 0.0483640 -1.458 0.14507

get\_dogborn bought 0.0109483 0.0467436 0.234 0.81486

get\_dogpresent 0.0150605 0.0405747 0.371 0.71057

Where\_dog\_is\_keptGarden -0.0236345 0.0460941 -0.513 0.60823

Where\_dog\_is\_keptApartment -0.0843747 0.0427818 -1.972 0.04883 \*

dog\_obedience2 tasks 0.0592757 0.0508704 1.165 0.24417

dog\_obedience3 tasks -0.0533578 0.0486774 -1.096 0.27325

dog\_obedience>3 tasks -0.1345657 0.0465515 -2.891 0.00392 \*\*

play30m-1h 0.0075999 0.0477593 0.159 0.87360

play1-3h -0.0109623 0.0485097 -0.226 0.82126

play>3h 0.0205161 0.0586810 0.350 0.72669

commands11-30 0.0394039 0.0326373 1.207 0.22756

commands>30 0.0488699 0.0526226 0.929 0.35325

training2-3 -0.0159693 0.0357867 -0.446 0.65551

training4 more 0.0249990 0.0412919 0.605 0.54502

dog\_beh\_changed\_3monthYes 0.0545225 0.0316365 1.723 0.08509 .

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.435 on 1119 degrees of freedom

(36 observations deleted due to missingness)

Multiple R-squared: 0.1162, Adjusted R-squared: 0.07589

F-statistic: 2.884 on 51 and 1119 DF, p-value: 2.138e-10

> Residuals <- residuals (lm)

> qqnorm(Residuals)

> shapiro.test (Residuals)

Shapiro-Wilk normality test

data: Residuals

W = 0.99784, p-value = 0.1285

> data$food <- as.factor(data$food)

> com=glht(lm,linfct=mcp(food="Tukey"))

> summary(com)

Simultaneous Tests for General Linear Hypotheses

Multiple Comparisons of Means: Tukey Contrasts

Fit: lm(formula = bcPower(DPQFAC5new, 0.46) ~ (age + sensory + height +

weight + breed + sex + neuter + offleash\_activity + BCS +

food + Add\_vitamins + trauma + Health\_prob + medication +

Owner\_age + Age\_of\_dog\_when\_arrived + get\_dog + Where\_dog\_is\_kept +

dog\_obedience + play + commands + training + dog\_beh\_changed\_3month),

data = data, na.action = na.omit)

Linear Hypotheses:

Estimate Std. Error t value Pr(>|t|)

Tinned &/or Dry food-Dry food only== 0 -0.10466 0.04712 -2.221 0.17093

Cooked food - Dry food only == 0 0.02548 0.03850 0.662 0.96399

Mixed - Dry food only == 0 0.06155 0.04041 1.523 0.54492

Raw - Dry food only == 0 0.03812 0.04285 0.890 0.89986

Cooked food - Tinned &/or Dry food== 0 0.13014 0.04540 2.867 0.03388 \*

Mixed - Tinned and/or Dry food == 0 0.16621 0.04696 3.540 0.00377 \*\*

Raw - Tinned and/or Dry food == 0 0.14278 0.05023 2.843 0.03625 \*

Mixed - Cooked food == 0 0.03607 0.03867 0.933 0.88312

Raw - Cooked food == 0 0.01263 0.04179 0.302 0.99816

Raw - Mixed == 0 -0.02343 0.04307 -0.544 0.98246

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Adjusted p values reported -- single-step method)

#### Outliers removed (1 removed)

> lm<-lm(bcPower(outDPQFAC5new,0.46)~(age+sensory+height+weight+breed+sex+neuter+offleash\_activity+BCS+food+Add\_vitamins+trauma+Health\_prob+medication+Owner\_age+Age\_of\_dog\_when\_arrived+get\_dog+Where\_dog\_is\_kept+dog\_obedience+play+commands+training+dog\_beh\_changed\_3month), data = data, na.action = na.omit)

> etasq(lm, anova = TRUE, type=3)

Anova Table (Type III tests)

Response: bcPower(outDPQFAC5new, 0.46)

Partial eta^2 Sum Sq Df F value Pr(>F)

(Intercept) 0.115140 27.351 1 145.4767 < 2.2e-16 \*\*\*

age 0.017785 3.806 5 4.0488 0.001202 \*\*

sensory 0.006050 1.279 1 6.8055 0.009209 \*\*

height 0.000982 0.207 1 1.0985 0.294832

weight 0.001180 0.248 1 1.3206 0.250734

breed 0.005195 1.098 1 5.8380 0.015843 \*

sex 0.002856 0.602 1 3.2020 0.073820 .

neuter 0.002350 0.495 1 2.6330 0.104948

offleash\_activity 0.007285 1.542 4 2.0510 0.085159 .

BCS 0.003134 0.661 2 1.7574 0.172961

food 0.012071 2.568 4 3.4150 0.008728 \*\*

Add\_vitamins 0.002075 0.437 3 0.7751 0.507969

trauma 0.006858 1.451 1 7.7198 0.005553 \*\*

Health\_prob 0.007841 1.661 4 2.2089 0.066063 .

medication 0.000183 0.038 1 0.2047 0.651058

Owner\_age 0.000310 0.065 3 0.1155 0.951016

Age\_of\_dog\_when\_arrived 0.008250 1.749 3 3.1002 0.025954 \*

get\_dog 0.000127 0.027 2 0.0713 0.931218

Where\_dog\_is\_kept 0.004217 0.890 2 2.3675 0.094182 .

dog\_obedience 0.020620 4.425 3 7.8463 3.489e-05 \*\*\*

play 0.000683 0.144 3 0.2548 0.857973

commands 0.001760 0.371 2 0.9858 0.373456

training 0.000744 0.156 2 0.4161 0.659741

dog\_beh\_changed\_3month 0.002271 0.478 1 2.5443 0.110975

Residuals 210.194 1118

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> summary(lm)

Call:

lm(formula = bcPower(outDPQFAC5new, 0.46) ~ (age + sensory +

height + weight + breed + sex + neuter + offleash\_activity +

BCS + food + Add\_vitamins + trauma + Health\_prob + medication +

Owner\_age + Age\_of\_dog\_when\_arrived + get\_dog + Where\_dog\_is\_kept +

dog\_obedience + play + commands + training + dog\_beh\_changed\_3month),

data = data, na.action = na.omit)

Residuals:

Min 1Q Median 3Q Max

-1.2470 -0.2964 0.0037 0.3031 1.1243

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 1.360562 0.112803 12.061 < 2e-16 \*\*\*

ageGroup2 0.019623 0.044922 0.437 0.66233

ageGroup3 0.127106 0.048521 2.620 0.00892 \*\*

ageGroup4 0.120837 0.049733 2.430 0.01527 \*

ageGroup5 0.020514 0.053157 0.386 0.69963

ageGroup6 -0.048145 0.057256 -0.841 0.40060

sensoryPresent -0.108555 0.041612 -2.609 0.00921 \*\*

height -0.001351 0.001289 -1.048 0.29483

weight 0.001832 0.001594 1.149 0.25073

breedPure -0.084133 0.034821 -2.416 0.01584 \*

sexMale 0.048659 0.027193 1.789 0.07382 .

neuterNeutered -0.047795 0.029455 -1.623 0.10495

offleash\_activity30mins/1hour -0.033162 0.045322 -0.732 0.46450

offleash\_activity1/3 -0.111645 0.044080 -2.533 0.01145 \*

offleash\_activity3/7 -0.046839 0.051902 -0.902 0.36701

offleash\_activity>7 -0.062323 0.050981 -1.222 0.22179

BCSNormal -0.033834 0.036065 -0.938 0.34838

BCSOverweight -0.085235 0.046235 -1.843 0.06552 .

foodTinned and/or Dry food -0.105174 0.046973 -2.239 0.02535 \*

foodCooked food 0.025453 0.038375 0.663 0.50729

foodMixed 0.061434 0.040280 1.525 0.12750

foodRaw 0.030642 0.042797 0.716 0.47415

Add\_vitaminsRarely -0.044570 0.034224 -1.302 0.19308

Add\_vitaminsOften -0.027740 0.038991 -0.711 0.47695

Add\_vitaminsDaily 0.001044 0.040679 0.026 0.97953

traumaYes 0.081080 0.029182 2.778 0.00555 \*\*

Health\_probTooth problem only 0.120558 0.043610 2.764 0.00580 \*\*

Health\_probJoint & Tooth probs 0.051417 0.051753 0.994 0.32068

Health\_probJoint problems only 0.067981 0.039599 1.717 0.08630 .

Health\_probOther disorders 0.078293 0.042674 1.835 0.06682 .

medicationYes -0.017646 0.039003 -0.452 0.65106

Owner\_age30-39 0.001533 0.034167 0.045 0.96423

Owner\_age40-49 0.011271 0.037054 0.304 0.76104

Owner\_age>50 0.020574 0.039194 0.525 0.59974

Age\_of\_dog\_when\_arrived7-12w 0.058252 0.034226 1.702 0.08903 .

Age\_of\_dog\_when\_arrived3-12m 0.033134 0.043910 0.755 0.45066

Age\_of\_dog\_when\_arrived>1y -0.070330 0.048209 -1.459 0.14489

get\_dogborn bought 0.008325 0.046603 0.179 0.85825

get\_dogpresent 0.014784 0.040445 0.366 0.71478

Where\_dog\_is\_keptGarden -0.026773 0.045960 -0.583 0.56032

Where\_dog\_is\_keptApartment -0.082921 0.042648 -1.944 0.05211 .

dog\_obedience2 tasks 0.059101 0.050708 1.166 0.24406

dog\_obedience3 tasks -0.055127 0.048526 -1.136 0.25619

dog\_obedience>3 tasks -0.141124 0.046459 -3.038 0.00244 \*\*

play30m-1h 0.017042 0.047721 0.357 0.72106

play1-3h -0.001272 0.048473 -0.026 0.97906

play>3h 0.029153 0.058571 0.498 0.61877

commands11-30 0.043670 0.032567 1.341 0.18022

commands>30 0.053949 0.052484 1.028 0.30422

training2-3 -0.013761 0.035681 -0.386 0.69982

training4 more 0.027331 0.041168 0.664 0.50689

dog\_beh\_changed\_3monthYes 0.050355 0.031569 1.595 0.11097

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.4336 on 1118 degrees of freedom

(37 observations deleted due to missingness)

Multiple R-squared: 0.1176, Adjusted R-squared: 0.07735

F-statistic: 2.922 on 51 and 1118 DF, p-value: 1.205e-10