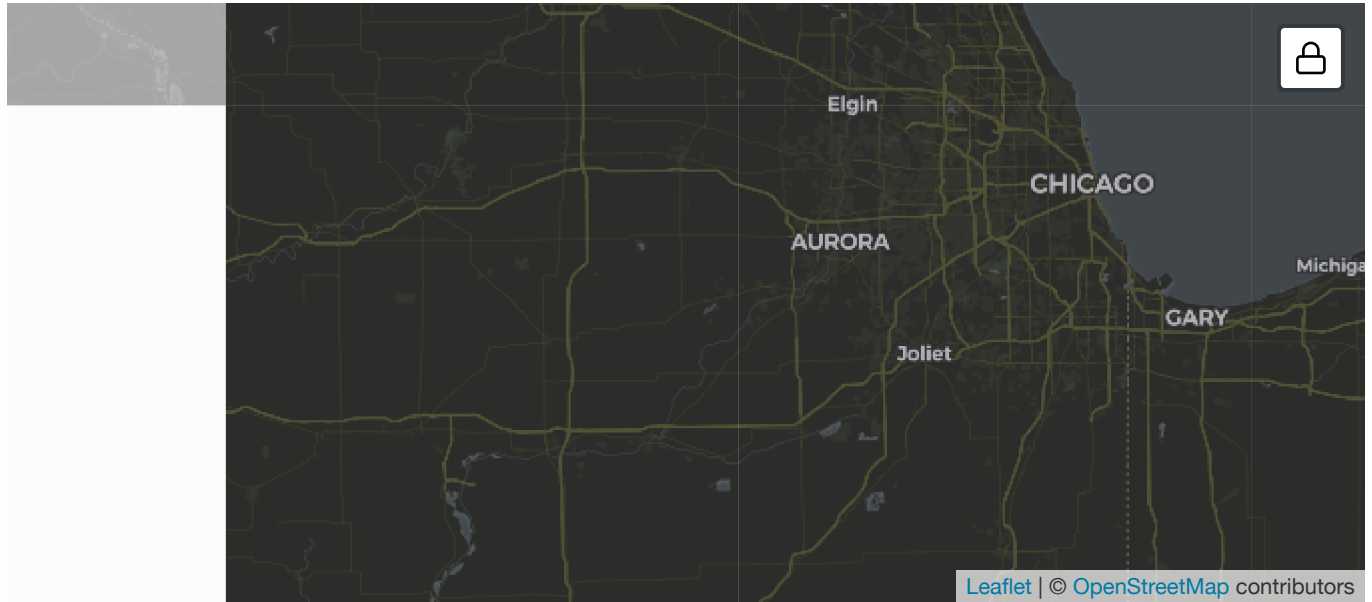


2021 Regmi RFID

Background



current goal: import and clean data, calculate time budgets and report differences

Joint Analysis

- ✓ ~~Function to determine the nesting zone~~
- ✓ ~~where do the high birds nest at night~~
- ✓ ~~where do the low birds nest at night~~
- ✓ ~~use overall tb classification for day and night~~
- ✓ ~~why is there no overall room_8_6928?~~
- ✓ ~~individual room nesting at night~~

I was able to find the nesting sites for each room:

Parameters/Background

All Room Analysis

Start Date: 2021-03-10 T04:00:00

End Date: 2021-05-06 T22:00:00

tagname	ntrans	rm	activity
6929	190	8	low
6988	195	2	low
6939	200	8	low
6942	225	2	low
6996	225	8	low
6997	240	8	low
9042	252	11	low
6961	255	8	low
6928	267	8	low
6931	267	8	low
6945	269	8	medium
6986	278	2	medium
6950	425	8	medium
9023	492	8	medium
6989	527	2	medium
9050	545	11	medium
9001	550	2	medium
6940	559	8	medium
6979	564	8	medium
9019	597	2	medium
6925	638	2	medium
7000	657	8	medium
6935	660	2	medium
9026	716	2	medium
9038	762	11	medium
6982	818	8	medium
9012	833	8	medium

tagname	ntrans	rm	activity
6981	839	2	medium
6922	888	3	high
6973	1028	8	high
6913	1040	8	high
6984	1101	8	high
6992	1262	3	high
6934	2076	3	high
6976	2548	3	high
9013	3428	3	high
6980	4072	3	high

\

Room	N Birds	N days	N weeks
2	10	58	9
3	6	58	9
8	18	58	9
11	3	58	9
Overall	37	58	9

Most Common Nesting Sites for Each Room Based on Activity Level

Room	Low	Medium	High
2	Bottom	Middle	Bottom/Middle/Top (1)
3	Bottom	Bottom/Middle (1)	Top
8	Bottom	top(4)/Bottom(3)	Top
11	Bottom (1)	Top (1)	Top (1)
Overall	Bottom (9)	Top (10)	Bottom (4) / Top (3)

Diagnostic Notes

There was an issue with the nightZoneFromTB. I was not selecting the zone with the greatest number of time rather the least. I fixed this but that means the table will need to be fixed. Which is now done (2023-11-09)

todone come back and look at this with fresh eyes

- ☐ does the weekly time budget differ from Feb/Mar to April
- ☒ ~~Rebuild Docker img with emmeans, lme4, lmeTest and other mixed linear model from stats~~
 - ~~Tagged as lorentzb/rfid:1.4~~

Notes from: Does the weekly time budget differ from March to April?

From the meeting with Drew this week: the model we want to build is:
 $\text{timeInZone} = \text{Activity} + \text{Week} + \text{Activity}:\text{Week} + (1 \mid \text{tagname})$

We have a good model set up now prototyped on the average bottom prop time compared to week and activity level.

For the bottom, there is an effect of time and activity level of time spent, but there is not an interaction of the two, AND the first week differs from the last week, BUT the first four weeks do not differ from the last four weeks, so there might be a gradient type effect on the amount of time a bird spends in the bottom zone.

I think on further examination we should go with the joint means because there is a little interaction and this way we can be safe.

- ☒ ~~add the package pbkrtest for emmeans to work correct to docker~~
~~Done built tag 1.5 and pushed~~
- ☒ ~~Test for a linear effect or non-linear~~

```
Test of linear effect of baking temp:  
(contrasts.temp <- contrast(margMeans.temp,"poly"))[1]
```

```
contrast estimate SE df t.ratio p.value  
linear 55.3 5.64 210 9.802 <.0001
```

```
Results are averaged over the levels of: recipe  
Degrees-of-freedom method: kenward-roger # Joint test of quadratic & higher  
contrasts tests nonlinearity:
```

```
test(contrasts.temp, rows=2:5, joint=TRUE)  
  
df1 df2 F.ratio p.value 4 210 1.632 0.1675
```

The effect slices contrast for linear/non-linear looks like this:

```
> contrast(m1.bottom.means$jointMeans, simple='weekFac', "poly")
```

```
activity = low:
```

contrast	estimate	SE	df	t.ratio	p.value
linear	0.0939	0.244	272	0.384	0.7011
quadratic	-3.5806	1.661	272	-2.156	0.0319
cubic	0.6783	0.992	272	0.684	0.4949
quartic	-0.2660	1.411	272	-0.188	0.8506
degree 5	-0.7644	0.682	272	-1.120	0.2636
degree 6	-0.4027	1.403	272	-0.287	0.7744

```
activity = medium:
```

contrast	estimate	SE	df	t.ratio	p.value
linear	0.3036	0.182	272	1.667	0.0966
quadratic	-6.9472	1.238	272	-5.613	<.0001
cubic	2.4353	0.740	272	3.292	0.0011
quartic	-0.4410	1.052	272	-0.419	0.6754
degree 5	0.2351	0.509	272	0.462	0.6442
degree 6	0.3769	1.046	272	0.360	0.7189

```
activity = high:
```

contrast	estimate	SE	df	t.ratio	p.value
linear	0.0798	0.258	272	0.310	0.7569
quadratic	-1.2542	1.750	272	-0.717	0.4743
cubic	1.5053	1.046	272	1.439	0.1513
quartic	-2.6799	1.488	272	-1.802	0.0727
degree 5	-0.1203	0.719	272	-0.167	0.8673
degree 6	-0.6150	1.479	272	-0.416	0.6779

```
Degrees-of-freedom method: kenward-roger
```

Question for Regmi: do you want to compare more than the first to last week?

Question for Regmi: do you want to compare the linear/non-linear effect of weeks when sliced on activity level?

```
>  
contrast(m1.bottom.means$jointMeans,simple='activity',"poly",adjust='bonferroni')
```

☒ ~~Compare week 1 to last week~~

Results from Does the weekly time budget differ from March to April?

Bottom Zone

The model:

```
> rm1 <- lmer(bottom_mean ~ weekFac + activity + weekFac:activity + (1|tagname),  
overall_day_summary)
```

```
> head(overall_day_summary, n=5)  
  tagname week bottom_mean middle_mean top_mean activity weekFac  
1   6913   10   0.2026082   0.5873601 0.2100316      high     10  
2   6913   11   0.2941982   0.5565399 0.1492620      high     11  
3   6913   12   0.2263931   0.5954119 0.1781950      high     12  
4   6913   13   0.1223838   0.7575695 0.1200467      high     13  
5   6913   14   0.1084255   0.6527069 0.2388676      high     14
```

The proportion of variance accounted for from bird-to-bird differences is 0.0417 compared to the variance of the residuals of 0.0099

Groups	Name	Variance	Std.Dev.
tagname	(Intercept)	0.041706	0.20422
Residual		0.009948	0.09974
Number of obs:	333,	groups:	tagname,37

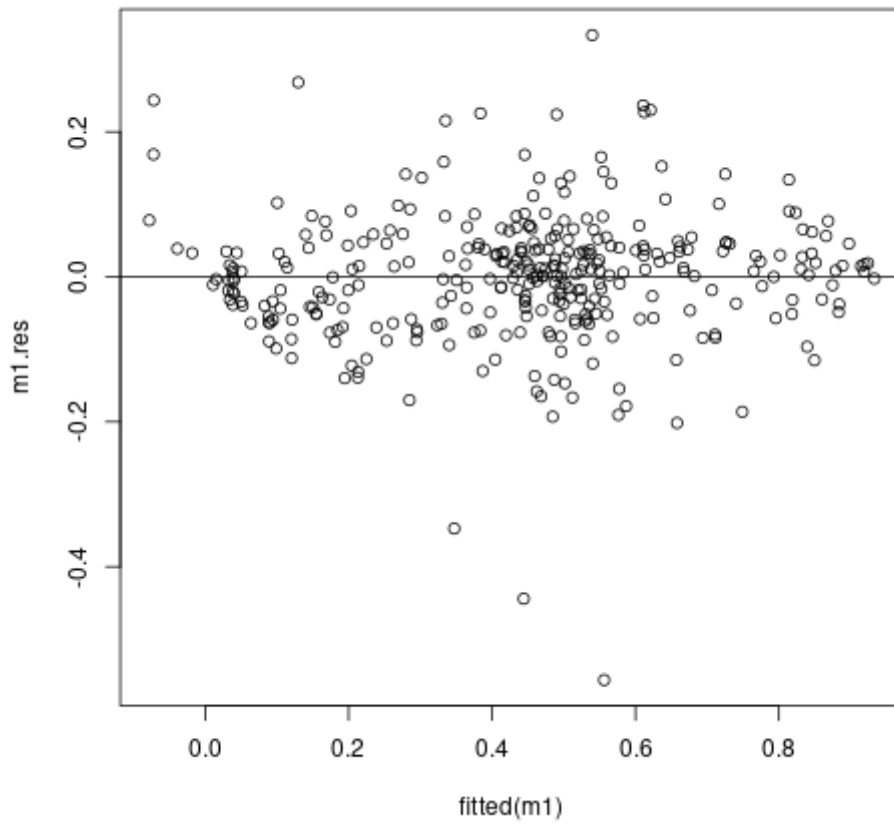
Main effects for Bottom Zone:

Type III Analysis of Variance Table with Satterthwaite's method

	Sum Sq	Mean Sq	NumDF	DenDF	F-value	Pr(>F)
weekFac	0.31099	0.038874	8	272	3.9077	0.0002188***
activity	0.11948	0.059742	2	34	6.0055	0.0058412**
weekFac:activity	0.18008	0.011255	16	272	1.1314	0.3255643

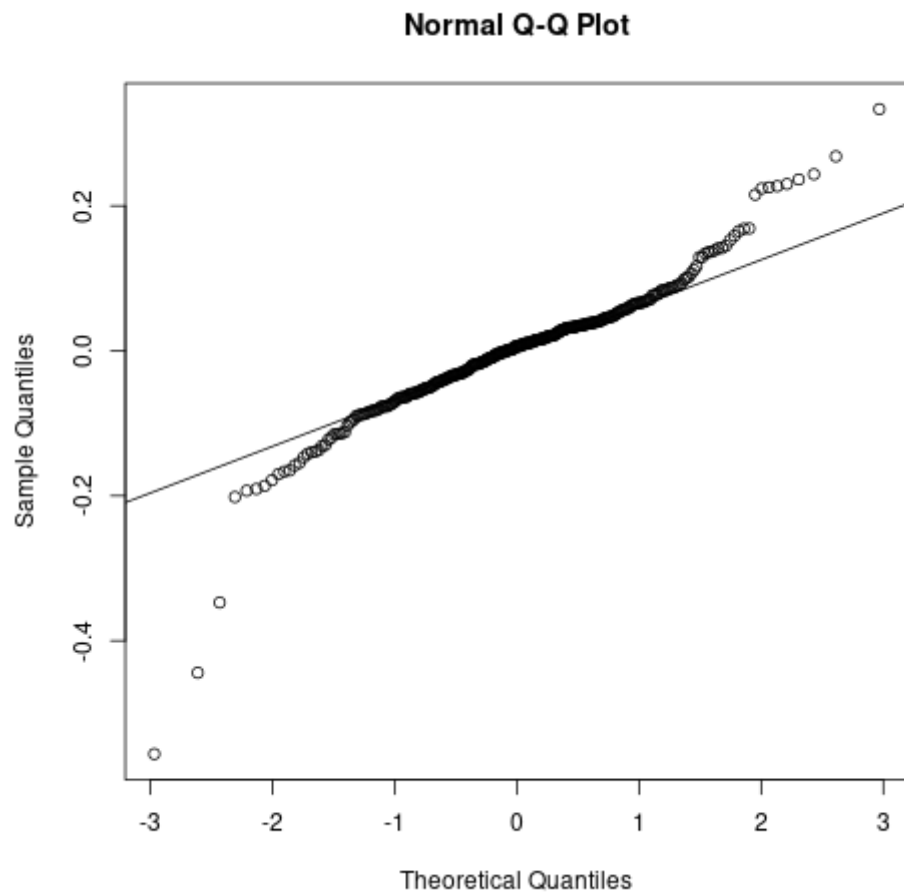
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1						

Model assumptions



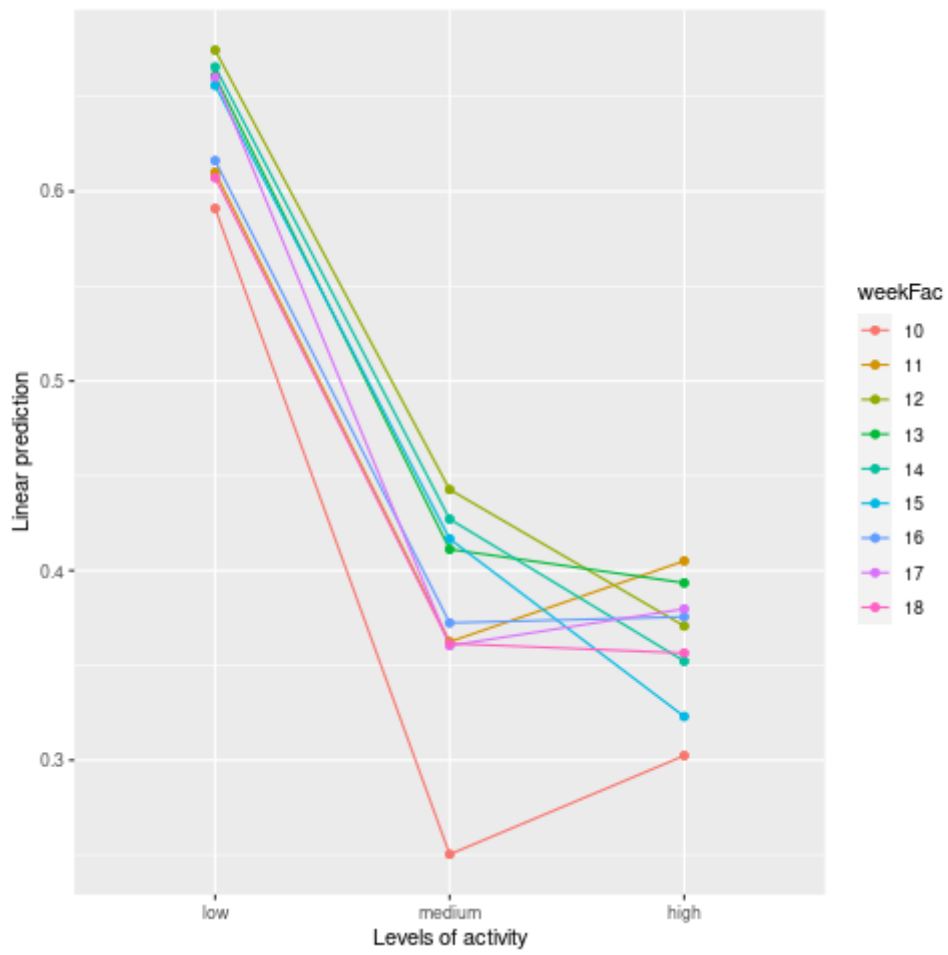
Residual plot for M1, Mean time spent in bottom zone

Little evidence of heteroscedastic so analysis can proceed.

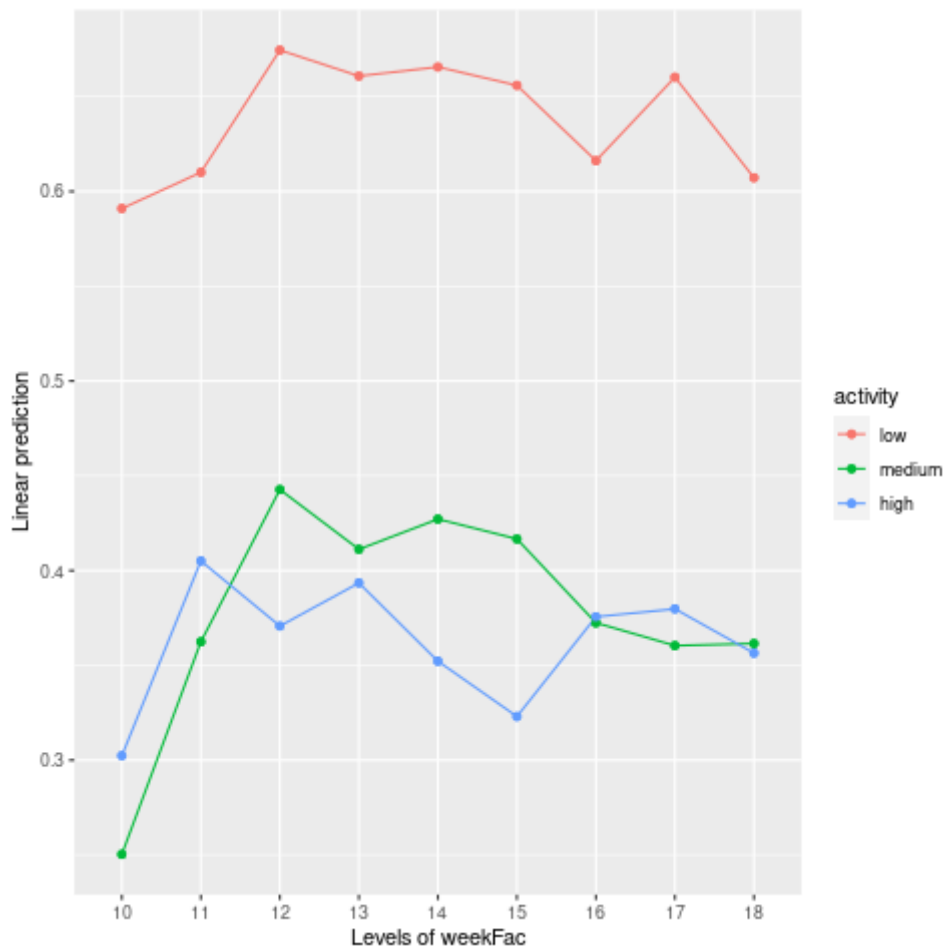


Normal Q-Q plot for M1, Mean time spent in bottom zone

Data look mostly Normally distributed with some deviation at the tails.



Interaction plot for M1, Mean time spent in bottom zone, week on activity



Interaction plot for M1, Mean time spent in bottom zone, activity on week

The main effects table suggested little evidence of interaction between activity level of the bird and the week of study ($F(16, 272) = 1.1314, p = 0.326$) however when plotting the interaction plots there appears to be a quantitative interaction between week and activity level. When plotting activity level on week, there appears to be a **qualitative interaction between week 12 and 16** so effect slices should be used for the analysis of differing means of activity levels sliced by week of analysis.

Does mean time spent in the bottom zone differ based on week of study? (Main effect of weekFac)

activity	df1	df2	F.ratio	p.value	note
low	8	272	0.986	0.4474	d
medium	8	272	5.962	<.0001	d
high	8	272	0.976	0.4553	d
d: df1 reduced due to linear dependence					

for low activity birds: the mean time spent in the bottom zone did not significantly differ across weeks of study ($F(8, 272) = 0.986, p = 0.4474$).

medium activity birds: the mean time spent in the bottom zone significantly differed across weeks of study ($F(8, 271) = 5.962, p < 0.001$)

high activity birds: the mean time spent in the bottom zone did not significantly differ across weeks of study ($F(8, 272) = 0.976, p = 0.4553$)

Does mean time spent in the bottom zone differ based on level of activity when sliced on week of study? (Main effect of activity)

weekFac	df1	df2	F.ratio	p.value	note
10	2	49.23	7.542	0.0014	d
11	2	49.23	3.954	0.0256	d
12	2	49.23	4.922	0.0113	d
13	2	49.23	4.631	0.0144	d
14	2	49.23	5.229	0.0087	d
15	2	49.23	5.677	0.006	d
16	2	49.23	4.161	0.0214	d
17	2	49.23	6.1	0.0043	d
18	2	49.23	4.325	0.0186	d
d: df1 reduced due to linear dependence					

At every week, the mean time spent in the bottom zone differed significantly between the activity levels of birds.

Contrasts to ask deeper questions

How do the medium activity birds differ over the weeks?

contrast	estimate	SE	df	t.ratio	p.value
first.vs.last	0.1112	0.0332	272	3.344	0.0019
fhalf.vs.lhalf	0.0444	0.0665	272	0.667	1

The mean time spent in the bottom zone of the medium activity level birds did significantly differ between the first and last week of the analysis ($t(272) = 3.344, p = 0.0019$)

The mean time spent in the bottom zone of the medium activity level birds did not significantly differ between the first four and last four weeks of the analysis ($t(272) = 0.667, p = 1$)

Is there a linear or non-linear effect of week on the mean time spent in the bottom zone when sliced by activity level?

Low Activity

contrast	activity	estimate	SE	df	t.ratio	p.value
linear	low	0.0939	0.244	272	0.384	0.7011

df1	df2	F.ratio	p.value
5	272	1.298	0.265

For the low activity classified birds, there is not a linear or a non-linear effect of week of study on mean time spent in the bottom zone ($t(272) = 0.384, p = 0.7011$)($F(5, 272) = 1.298, p = 0.265$)

Medium Activity

contrast	activity	estimate	SE	df	t.ratio	p.value
linear	medium	0.304	0.182	272	1.667	0.0966
df1	df2	F.ratio	p.value			
5	272	8.573	<.0001			

For the medium activity classified birds, there is not a linear effect of week of study on mean time spent in the bottom zone ($t(272) = 1.667, p = 0.0966$), however there is a non-linear effect of week of study on mean time spent in the bottom zone ($F(5, 272) = 8.573, p = < 0.001$)

High Activity

contrast	activity	estimate	SE	df	t.ratio	p.value
linear	high	0.0798	0.258	272	0.310	0.7569
df1	df2	F.ratio	p.value			
5	272	1.191	0.3139			

For the high activity classified birds, there is not a linear or a non-linear effect of week of study on mean time spent in the bottom zone ($t(272) = 0.310, p = 0.7569$)($F(5, 272) = 1.191, p = 0.3139$)

Middle Zone

The proportion of variance accounted for from bird-to-bird differences is 0.020472 compared to the variance of the residuals of 0.009541

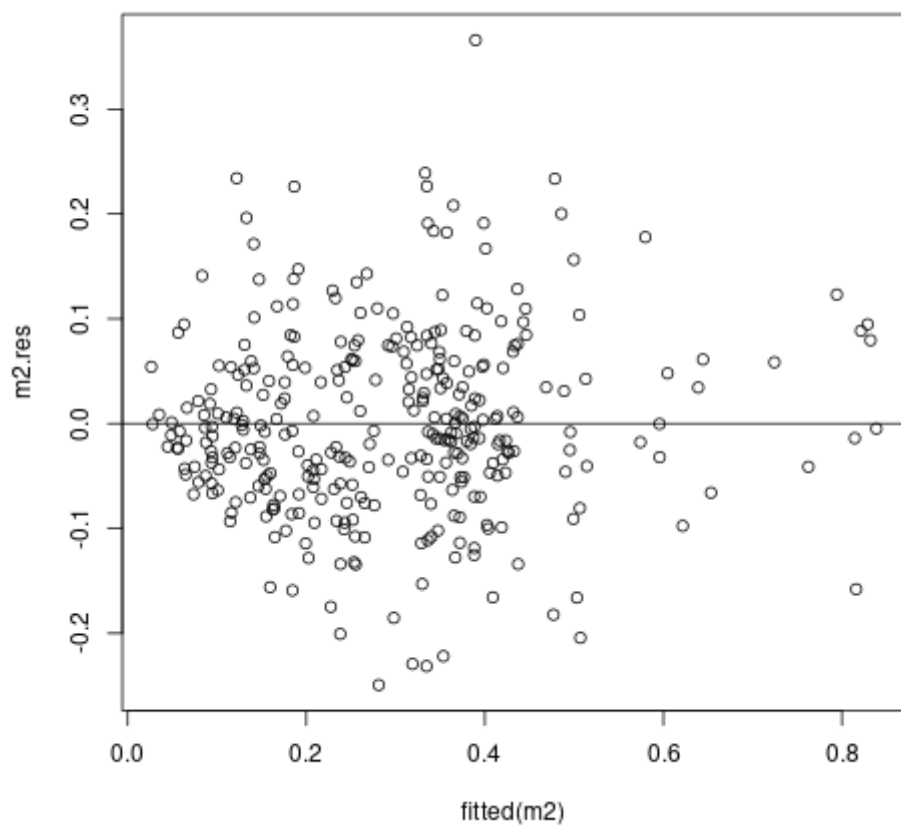
Random effects:			
Groups	Name	Variance	Std.Dev.
tagname	(Intercept)	0.020472	0.14308
Residual		0.009541	0.09768
Number of obs: 333, groups: tagname, 37			

Main effects for the middle zone:

Type III Analysis of Variance Table with Satterthwaite's method

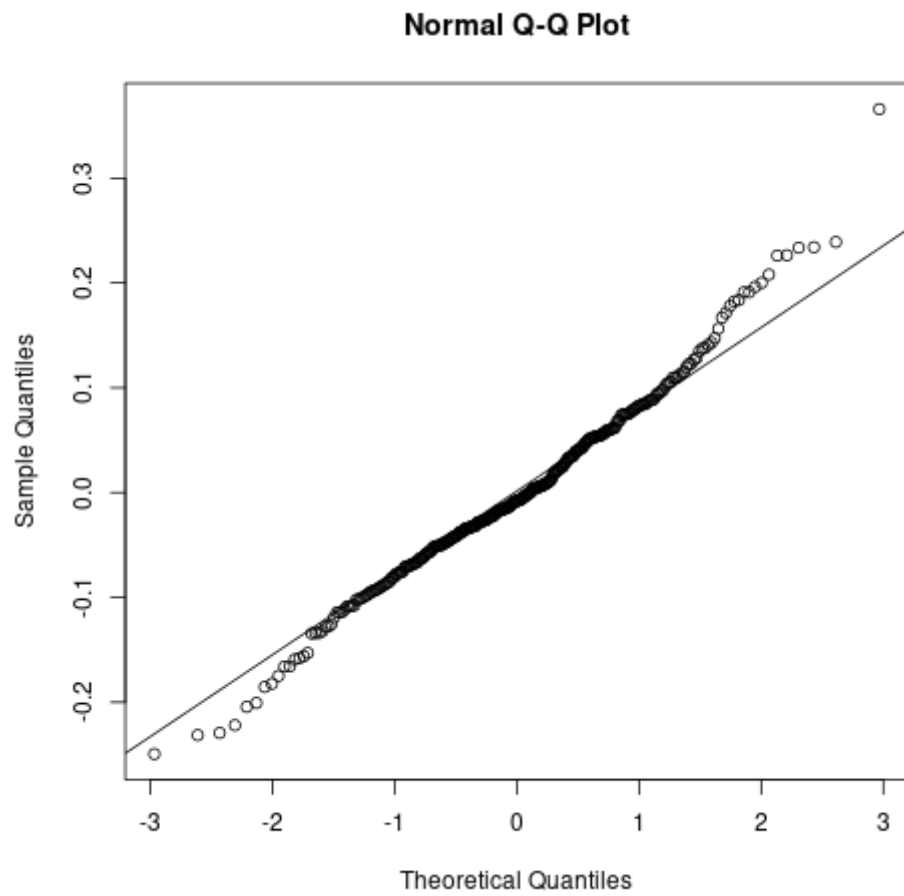
	SumSq	MeanSq	NumDF	DenDF	F	value	Pr(>F)
weekFac	0.129177	0.016147	8	272	1.6923	0.10014	
activity	0.098848	0.049424	2	34	5.1799	0.01087	*
weekFac:activity	0.097300	0.006081	16	272	0.6374	0.85234	

Model Assumptions:



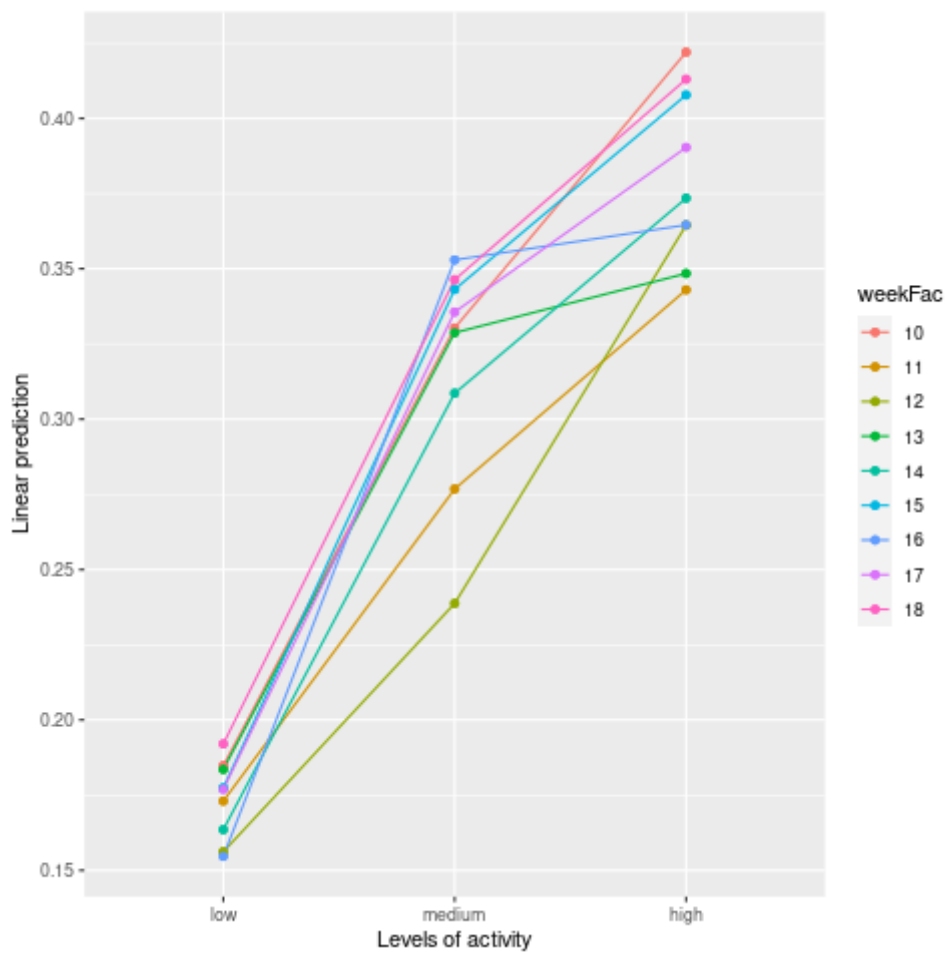
Residual plot for M2, Mean time spent in middle zone

Little evidence of heteroscedastic so analysis can proceed.

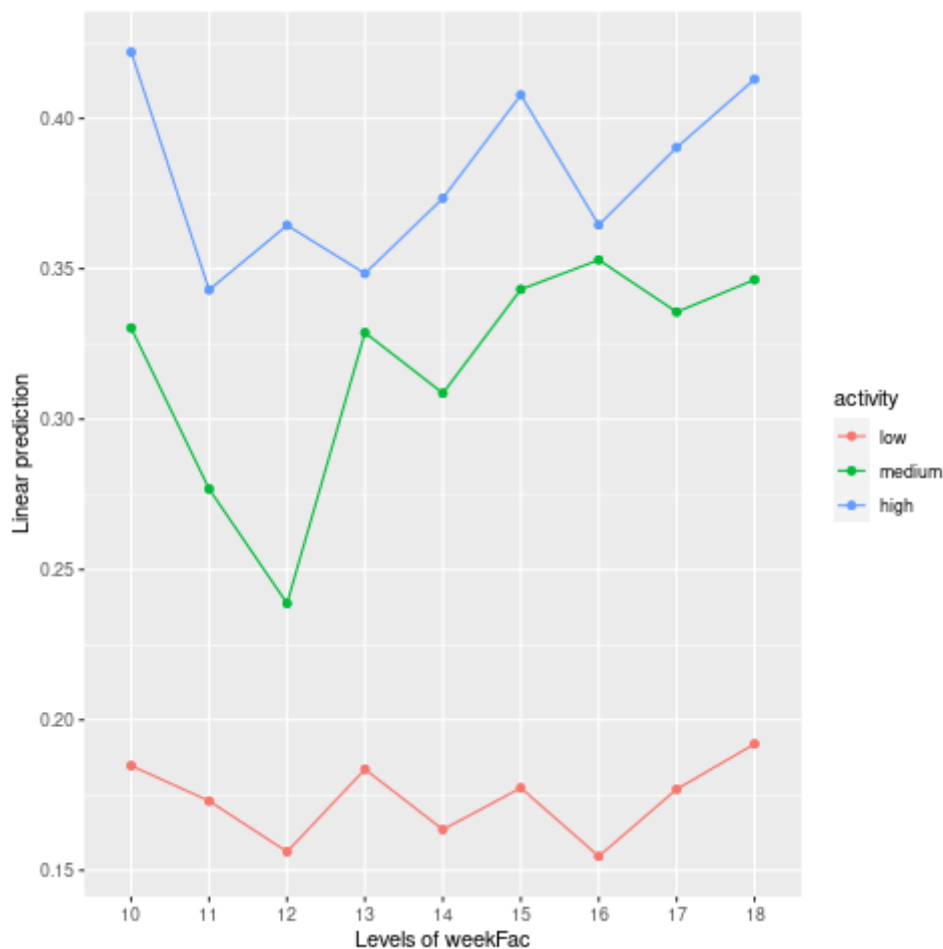


Normal Q-Q plot for M2, Mean time spent in middle zone

Data look mostly Normally distributed with some deviation at the tails.



Interaction plot for M2, Mean time spent in middle zone, week on activity



Interaction plot for M2, Mean time spent in middle zone, activity on week

The main effects table suggested little evidence of interaction between activity level of the bird and the week of study ($F(16, 272) = 0.6374, p = 0.85234$) and upon examination the interaction plots there was no evidence of interaction between week and activity level.

Main effect of week on mean time spent in middle zone:

There is not sufficient evidence to conclude that mean time spent in middle zone is different across weeks when averaged over activity levels ($F(8, 272) = 1.6923, p = 0.10014$)

Main effect of activity level on mean time spent in middle zone:

There is sufficient evidence to conclude that the mean time spent in the middle zone is different across activity levels when averaged over the weeks of the study ($F(2, 34) = 5.1799, p = 0.01087$)

Contrasts for Deeper Questions:

How does the time in the middle zone differ based on the activity levels?

contrast	estimate	SE	df	t.ratio	p.value
low.vs.med.high	0.1758	0.0552	34	3.182	0.0031
med.vs.high	0.0629	0.0599	34	1.049	0.3014

There is a significant difference in the mean time spent in the middle zone between low and medium and high activity birds ($t(34) = 3.182, p = 0.0031$), however there is not a significant difference in the mean time spent in the middle zone between the medium and high activity birds. ($t(34) = 1.049, p = 0.3014$)

Is there a linear or non-linear effect of week on the mean time spent in the middle zone?

contrast	estimate	SE	df	t.ratio	p.value
linear	0.227	0.13	272	1.742	0.0826
df1	df2	F.ratio	p.value		
5	272	1.802	0.1125		

There is not a significant linear effect of week on the mean amount of time spent in the middle zone ($t(272) = 1.742, p = 0.0826$)

There is not a significant non-linear effect of week on the mean amount of time spent in the middle zone either ($F(5, 272) = 1.802, p = 0.1125$)

Top Zone

The proportion of variance accounted for from bird-to-bird differences is 0.021008 compared to the variance of the residuals of 0.008554.

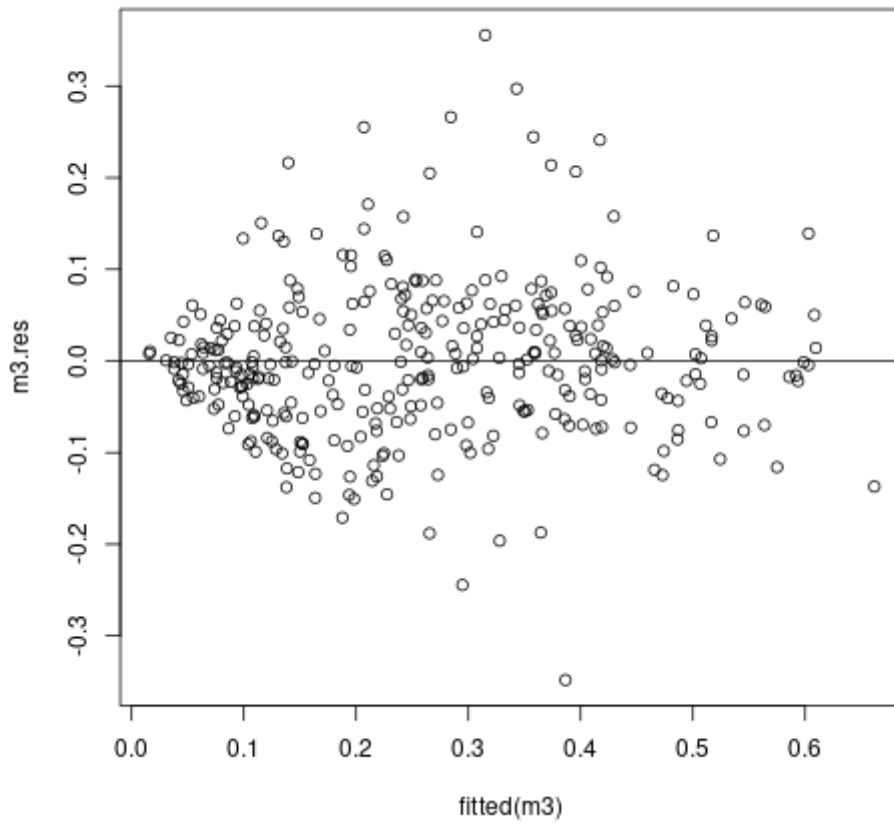
Random effects:			
Groups	Name	Variance	Std.Dev.
tagname	(Intercept)	0.021008	0.14494
Residual		0.008554	0.09249
Number of obs: 333, groups: tagname, 37			

Main effects for the top zone:

Type III Analysis of Variance Table with Satterthwaite's method

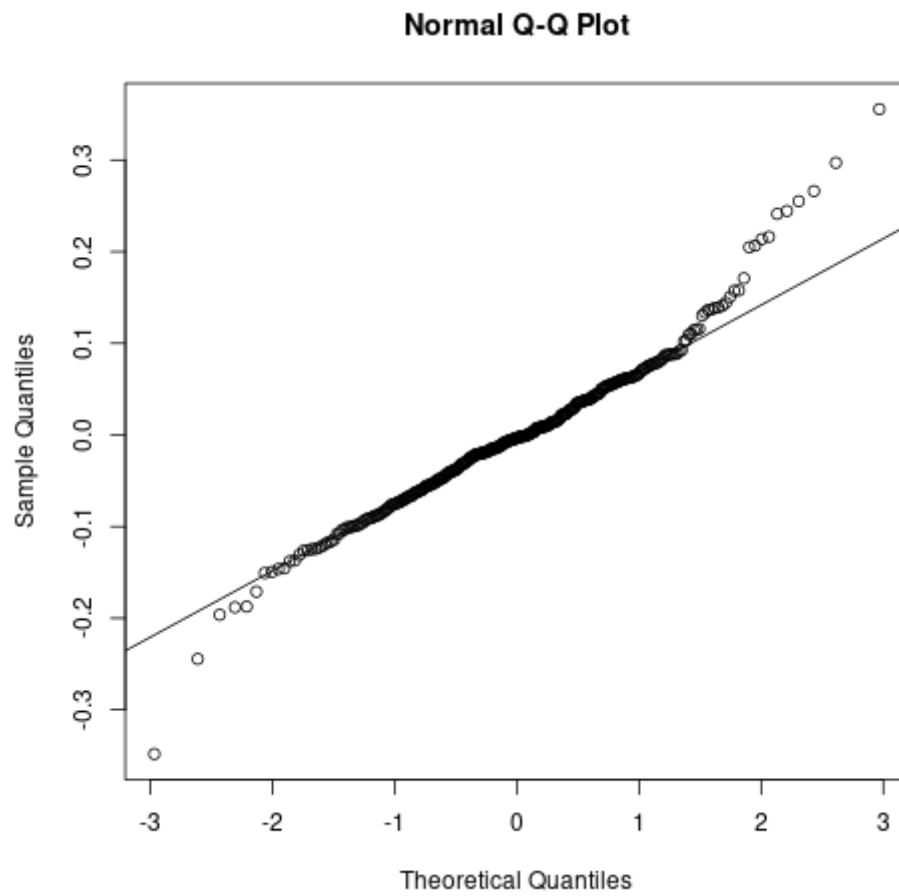
	SumSq	MeanSq	NumDF	DenDF	F	value	Pr(>F)
weekFac	0.193710	0.024214	8	272	2.8307	0.004935	**
activity	0.033369	0.016685	2	34	1.9505	0.157790	
weekFac:activity	0.217741	0.013609	16	272	1.5909	0.070684	.

Model Assumptions:



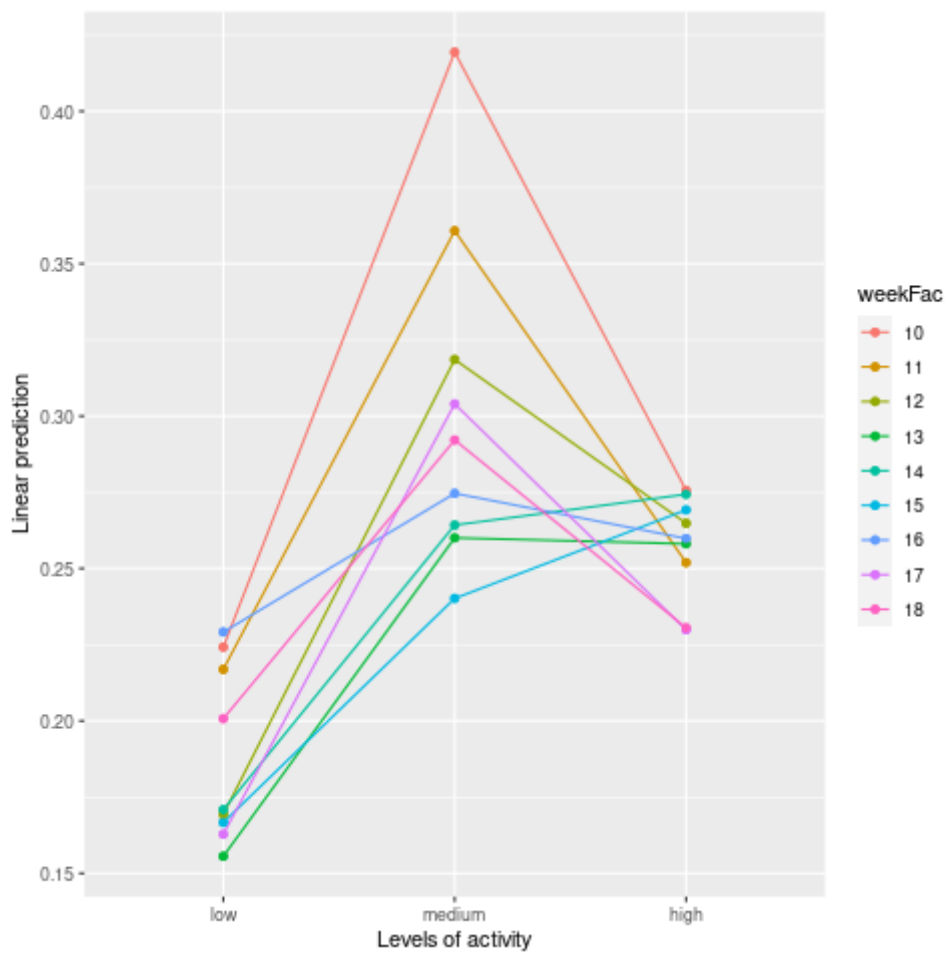
Residual plot for M3, Mean time spent in top zone

Little evidence of heteroscedastic so analysis can proceed.

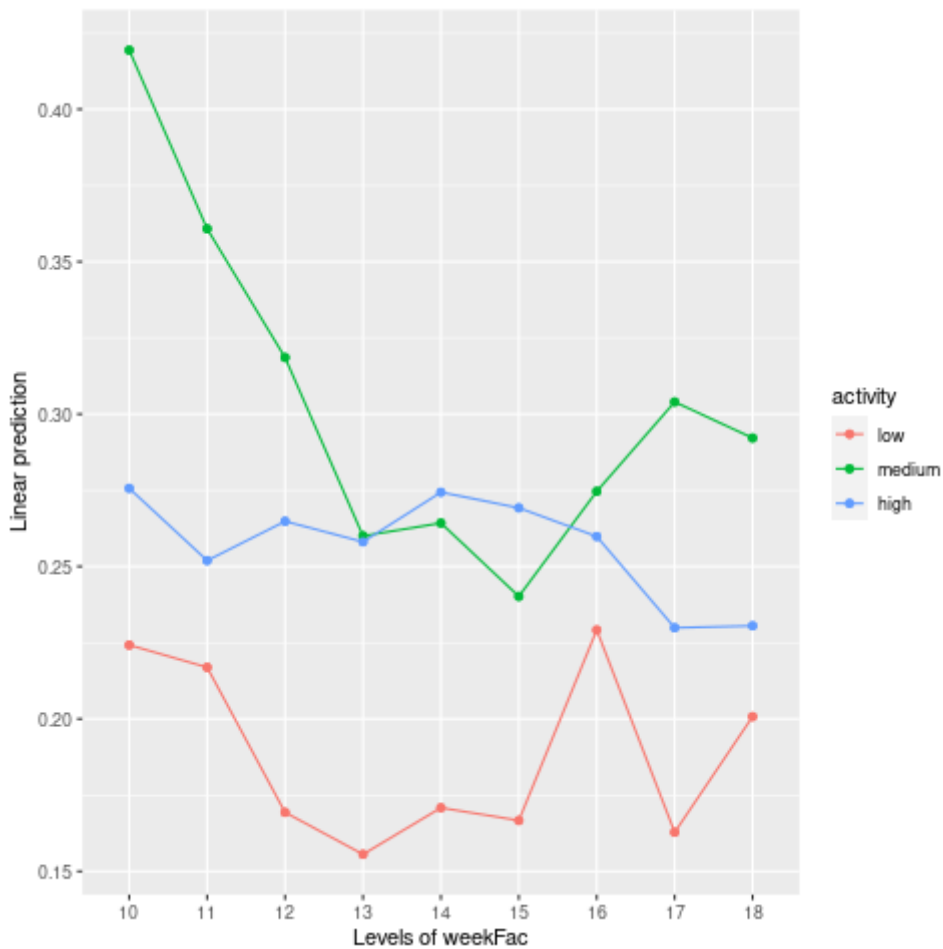


Normal Q-Q plot for M3, Mean time spent in top zone

Data look mostly Normally distributed with some deviation at the tails.



Interaction plot for M3, Mean time spent in top zone, week on activity



Interaction plot for M3, Mean time spent in top zone, activity on week

The main effects table suggested little evidence of interaction between activity level of the bird and the week of study ($F(16, 272) = 1.5909, p = 0.070684$) and upon examination the interaction plots there was little evidence of interaction between week and activity level.

Main effect of week on mean time spent in top zone:

There is not sufficient evidence to conclude that mean time spent in the top zone is different across activity levels when averaged over weeks ($F(2, 34) = 1.9505, p = 0.157790$)

Main effect of week on mean time spent in top zone:

There is sufficient evidence to conclude that the mean time spent in the top zone is different across weeks of study when averaged over the activity levels ($F(8, 272) = 2.8307, p = 0.004935$)

Contrasts for Deeper Questions:

How does the time in the top zone differ based on week?

contrast	estimate	SE	df	t.ratio	p.value
first.vs.last	0.196	0.0675	272	2.899	0.0081
ffour.vs.lfour	0.315	0.1351	272	2.335	0.0405

There is a significant difference in the mean time spent in the top zone between the first and last week of the study ($t(272) = 2.899, p = 0.0081$), and there is a significant difference in the first four weeks of the study vs the last four weeks of studies on the mean time spent in the top zone .
 $(t(272) = 2.335, p = 0.0405)$

Is there a linear or non-linear effect of week on the mean time spent in the top zone?

contrast		estimate	SE	df	t.ratio	p.value
linear		-0.386	0.123	272	-3.130	0.0019
df1	df2	F.ratio	p.value			
5	272	2.274	0.0475			

There is a significant linear effect of week on the mean amount of time spent in the top zone
 $(t(272) = -3.130, p = 0.0019)$

There is a significant non-linear effect of week on the mean amount of time spent in the top zone
 $(F(5, 272) = 2.274, p = 0.0475)$

Question for Regmi: do you want to compare more than the first to last week?

Question for Regmi: do you want to compare the linear/non-linear effect of weeks when sliced on activity level?

Find the Keel Score Data to use in the model

☒ Find the keel score data to use in model

I found

C:/Users/bjl34716/SynologyDrive/Regmi\San_antonio_PSA/PSA 2022.xls

C:/Users/bjl34716/SynologyDrive/Regmi\San_antonio_PSA/keel_score_psa.csv

I found an old email from Dr. Regmi from 2022-07-01 that had the keel score for most of the birds which we can use. Just need to turn it into csv format.

Notes from: does keel score change based on bird activity level and weeks?

☐ does keel score change based on bird activity level and weeks?

Results: Does keel score change based on bird activity level and weeks?

- ☐ Talk to Regmi About these Results
 - ☐ nesting zone by bird by week
-

Make Progress Report for Regmi

I have the bare-bones of a report but we need to add more, including the ANOVA tests comparing mean time spent in each zone.

Social Network Analysis of birds

[card](#)

current goal:

- ☐ Task 1
-

current goal:

Can we use resample track to make sure that the datetime is correct?

[card](#)

- ☐ Task 1
-