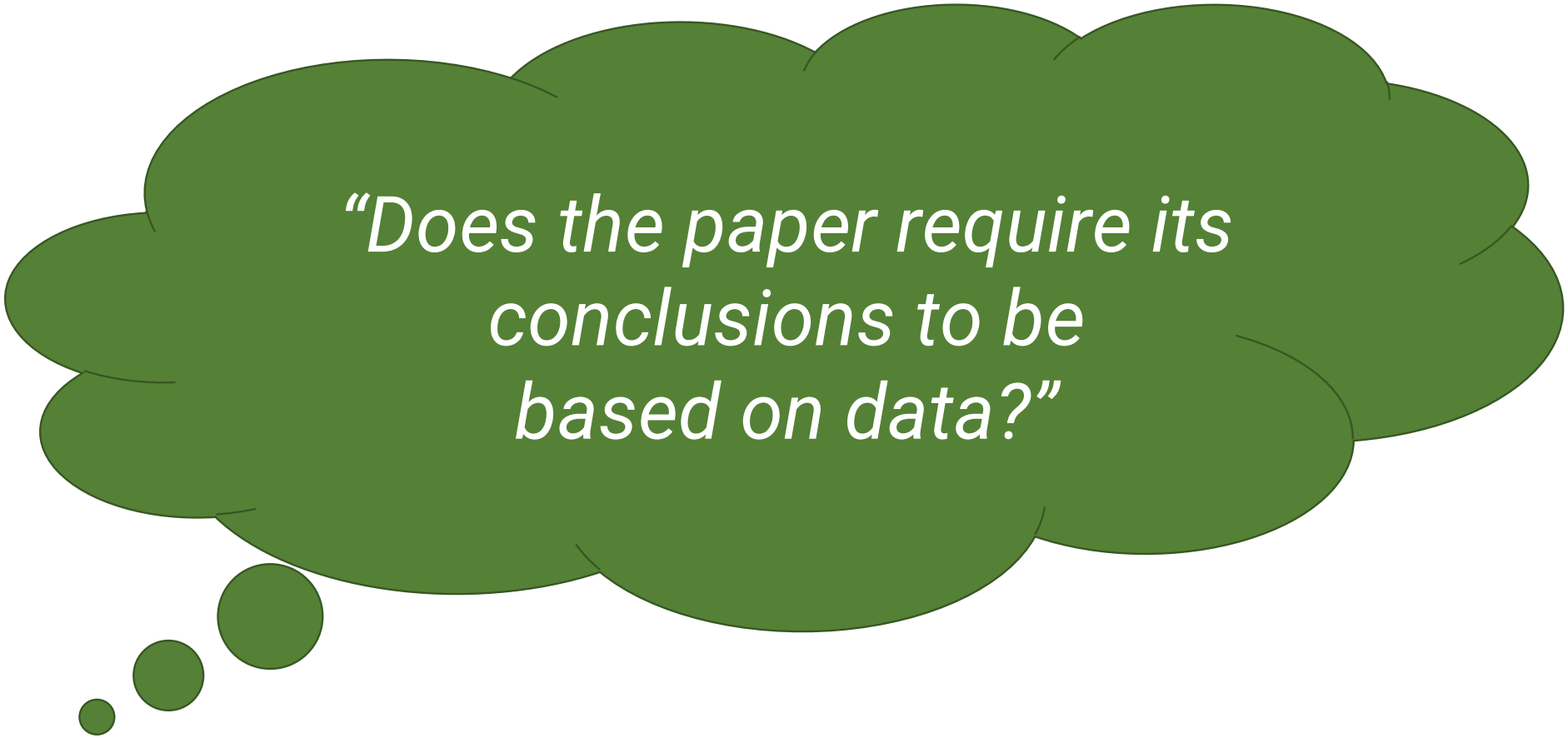
Evaluating Data and Results

What we will cover:

1. What to do when statistical analysis is lacking
2. Presentation of data
3. Statistical conventions of presenting data
4. Interpreting the significance of data

1. What if the Statistics are Missing?


"Does the paper require its conclusions to be based on data?"

1. **The need for statistics**
2. Presenting data
3. Ensuring validity

Is there a need for statistical analysis?

- If the research is based on deduction

  eg. a literature review

Is there a need for statistical analysis?

1. **The need for statistics**
2. Presenting data
3. Ensuring validity

NO

1. **The need for statistics**
2. Presenting data
3. Ensuring validity

Is there a need for statistical analysis?

- Method studies
  - Need for validity or precision will vary

1. **The need for statistics**
2. Presenting data
3. Ensuring validity

Is there a need for statistical analysis?

Possibly

1. **The need for statistics**
2. Presenting data
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Is there a need for statistical analysis?

- In empirical research
  - Uncertainty
  - Measurement error
  - Sample variation

Is there a need for statistical analysis?

1. **The need for statistics**
2. Presenting data
3. Ensuring validity

Yes

1. **The need for statistics**
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3. Ensuring validity

If statistical analysis has not been undertaken

- Findings from samples need data
- Request the authors provide the evidence

1. **The need for statistics**
2. Presenting data
3. Ensuring validity

If the statistical analysis is not explained

- No sample size
- An unclear unit of analysis
- Missing definitions for allocation of subjects to groups

“The statistical analysis units are not described in sufficient detail to allow a critical methodological review. I recommend the authors to comply with the ARRIVE guidelines and include a completed ARRIVE guidelines checklist.”

2. Presenting Data: Figures and Tables

1. The need for statistics
2. **Presenting data**
3. Ensuring validity

was unidentified. Most of the non-target OTUs were very rare in the dataset (79 of 86 with <10 sequences).

Despite pooling equimolar amounts of total genomic DNA, the total number of reads for each target OTU spanned three orders of magnitude. Based on expected number of reads calculated using the total amount of genomic DNA, 8 OTUs were highly under-represented (<4,000 sequences), while two taxa were highly over-represented (>80,000 sequences) (Fig. 4A). At the phylum level, the bias was less pronounced, but observed proportions of reads also differed from what was expected based on ratios of total genomic DNA pooled (Fig. 4B). Arthropoda (rank 1, Fig. 4B) and Platyhelminthes were underrepresented (rank 6, Fig. 4B) while Annelida was over represented (rank 2, Fig. 4B).

The 34 target OTUs were present in every one of the seven different indexed PCR trials (mean ±SD = 34 ±0.0). On the other hand, the 86 non-target OTUs appeared much less consistently; the mean (±SD) number of non-target OTUs per indexed PCR trial was 16 (±4.4) and 21 (±3.7) in MiSeq runs 1 and 2, respectively. After rarefying the dataset down to the lowest number of reads (45,609) to account for differences in sequencing depth, all target OTUs were still detected in all seven indexed PCR trials, whereas the mean (±SD) number of non-target OTUs per indexed PCR trial was only 12.6 (±3.9) and 18.6 (±2.9) in the two sequencing runs. The mean total number of OTUs was significantly different between MiSeq runs based on both the non-rarefied (t = -2.28, df = 11.6, P =0.04) and the rarefied datasets (t = -3.27, df = 11.2, P =0.01).

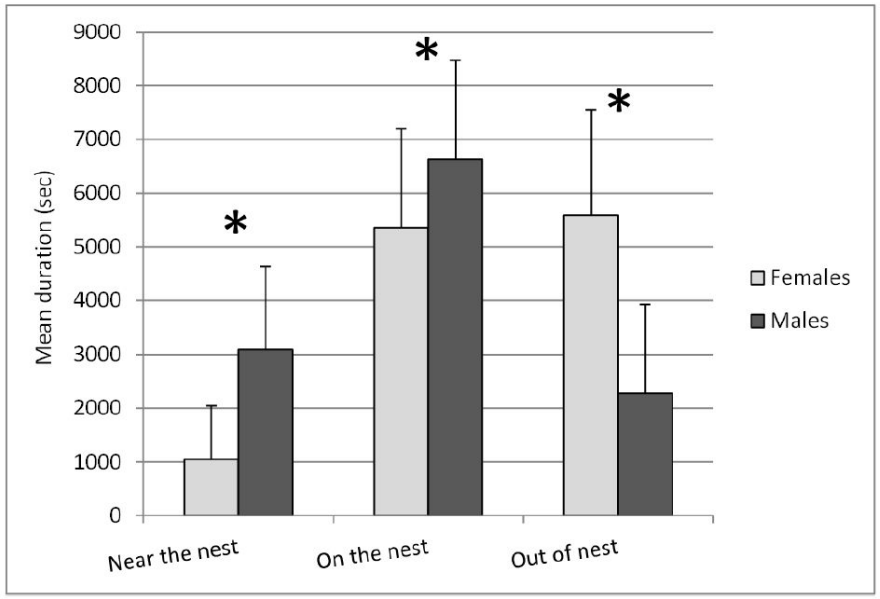
Leray M, Knowlton N. (2017) Random sampling causes the low reproducibility of rare eukaryotic OTUs in Illumina COI metabarcoding. PeerJ 5:e3006 https://doi.org/10.7717/peerj.3006

1. The need for statistics
2. **Presenting data**
3. Ensuring validity

- Highlight key elements
- No repetition of details

1. The need for statistics
2. **Presenting data**
3. Ensuring validity

- Understandable in isolation
- Descriptive titles
- Full words, not abbreviations
- Clearly labelled columns and rows



Validity of the findings

These comments relate to your results.

PAGE 22 - -

Table 1. What data are these? Please give units. It might also be better to provide standard error rather than standard deviation.

The table has been revised and improved. Basing on the reviewers' comments, the table reports medians and inter-quartile ranges (APA Style). Median durations of time spent in different posture are also reported and removed from the text to avoid redundancy.

Are you able to provide any graphical information to show the range of times for each bird that performed each behaviour? E.g. box plots that show the range, median, quartiles and outliers of the behaviours measured at an individual flamingo level?

Figure 1 has been replaced with new figures (box plots) providing medians and IQR.

- Line 137 onwards. Are these results not simply repeated in the table?

These results have been revised. Percentages have been provided in the text, medians (IQR) in the table.

- P values need to be presented as the test statistic, then the degrees of freedom and then the P value.

The manuscript has been revised. We used non-parametric statistic, specifically Mann-Whitney test on two same-size samples. Maybe degrees of freedom are not necessary, but N was provided.

PAGE 18 - Figures 1 and 2 are useful. They also show the units for all data, which would be helpful in the text (as per my comments above). Again, standard error bars might be more useful than standard deviation.

The figures have been revised and report median duration with IQR.

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How to be a great dad: parental care in a flock of greater flamingo (Phoenicopterus roseus).
PeerJ 5:e3404; DOI 10.7717/peerj.3404

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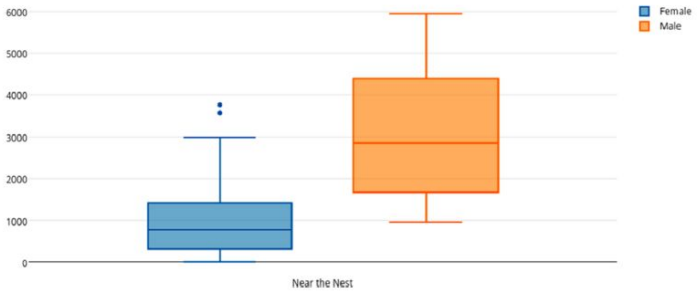

Figure 1 **Box and whisker plot of the time spent (seconds) by flamingo partners near the nest.** The horizontal lines within the box indicate the medians, boundaries of the box indicate the 25th and 75th percentile and the whiskers indicate the minimum and maximum values of the data samples. Outliers are drawn as points.

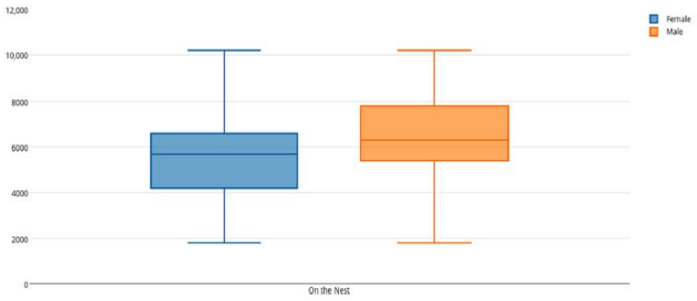

Figure 2 **Box and whisker plot of the time spent (seconds) by flamingo partners on the nest.** The horizontal lines within the box indicate the medians, boundaries of the box indicate the 25th and 75th percentile and the whiskers indicate the minimum and maximum values of the data samples. Outliers are drawn as points.

Validity of the findings

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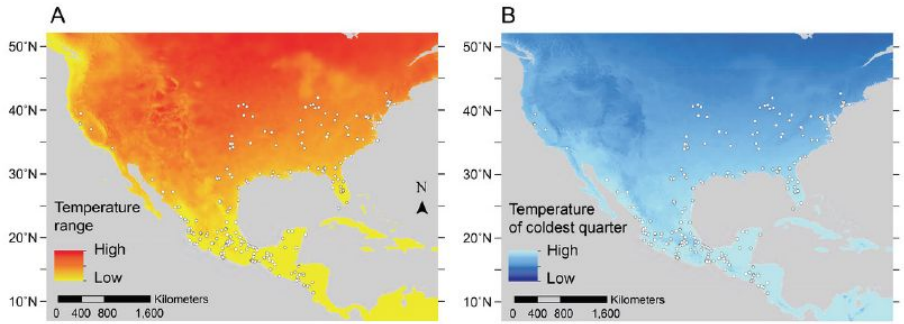
Maps of geographic variation for the most important environmental predictors associated with trait variation in *Didelphis virginiana*.

(A) Temperature range, (B) temperature of the coldest month, (C) precipitation seasonality and (D) temperature seasonality. The white dots show the distribution of Virginia opossum specimens used in this study.



Reviewer comment:

"Fig. 6A- May be you can rename the variable as "thermal amplitude", as temperature range high/low looks confusing in the figure."

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PeerJ https://doi.org/10.7287/peerj.4512v0.1/reviews/2

Maps of geographic variation for the most important environmental predictors associated with trait variation in *Didelphis virginiana*.

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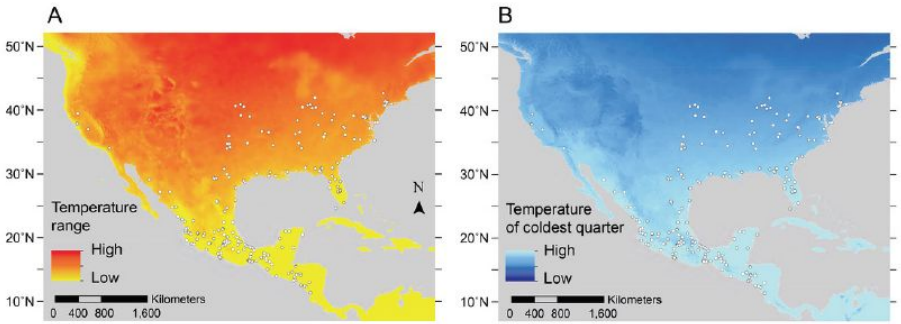

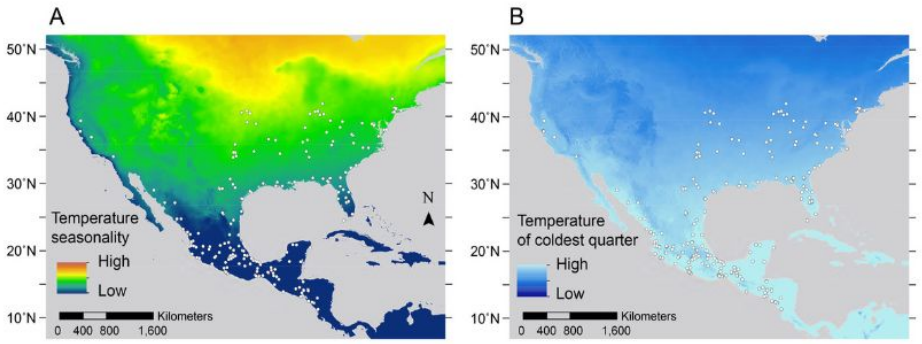

Figure 6: Maps of geographic variation for the most important environmental predictors associated with trait variation in *Didelphis virginiana*.
(A) Temperature seasonality, (B) temperature of the coldest month, (C) precipitation seasonality and (D) precipitation of the coldest quarter. The white dots show the distribution of Virginia opossum specimens used in this study.

Reviewer comment:

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Nigenda-Morales SF, Harrigan RJ, Wayne RK. (2018) Playing by the rules? Phenotypic adaptation to temperate environments in an American marsupial. PeerJ 6:e4512 https://doi.org/10.7717/peerj.4512

1. The need for statistics
2. **Presenting data**
3. Ensuring validity

Tables

- Specific numerical values
- Compare and contrast values
- Minimum of 2 rows and columns

Table 1: behavioural categories performed by flamingos near the nest and on the nest (standing and incubating). The table reports the mean ± SD duration of each behavioural category performed by females (F) and males (M) when they are near the nest, standing on the nest or incubating the egg.

	Near the nest		On the nest (standing)		On the nest (incubating)	
	F	M	F	M	F	M
Agonistic behaviour	82.26 ± 118.99	233.91 ± 222.63	19.91 ± 35.22	14.57 ± 19.02	636.17 ± 378.00	940.57 ± 444.17
Attentive behaviour	-	-	-	-	1577.34 ± 821.43	1949.89 ± 903.34
Comfort behaviour	263.91 ± 271.67	662.40 ± 569.73	83.11 ± 136.36	21.09 ± 42.79	157.46 ± 266.87	191.69 ± 296.26
Egg care	-	-	192.14 ± 187.04	223.89 ± 167.49	-	-
Nest-bulding	-	-	-	-	2306.31 ± 919.58	2766.91 ± 1259.69
Other	384.77 ± 439.51	1232.97 ± 859.03	-	-	-	-
Sleeping	318.91 ± 564.98	959.49 ± 733.02	-	-	387.06 ± 485.95	527.60 ± 669.19

Validity of the findings

These comments relate to your results.

PAGE 22 - -

Table 1. What data are these? Please give units. It might also be better to provide standard error rather than standard deviation.

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Table 2 Behavioural categories performed by flamingos near the nest and on the nest (standing and sitting). The table reports the median (IQR) duration in seconds of each behavioural category performed by females (F) and males (M) when they were near the nest, standing on the nest or sitting on the nest, incubating the egg. The last row reports the median (IQR) duration in seconds of time spent by female and male flamingos in different position.

	Near the nest		On the nest (standing)		On the nest (sitting)	
	F	M	F	M	F	M
Agonistic behaviour	40 (3–105.5)	187 (40–326)	11 (0–21)	8 (0–19)	545 (375–884)	921 (637–1105.5)
Comfort behaviour	231 (27–480)	524 (210–945)	14 (0–71.5)	0 (0–24)	64 (0–165.5)	59 (4–230.5)
Sleeping	55 (0–434)	934 (358–1378)	–	–	67 (0–634)	319 (0–714.5)
Egg care	–	–	148 (72–239.5)	172 (99–320)	–	–
Incubation	–	–	–	–	1,650 (1,081–1,895)	1,995 (1,181–2,578.5)
Nest-building	–	–	–	–	2,336 (1,523–2,956)	2,791 (2,036–3,469)
Other	255 (71–502)	1,093 (432–1,836.5)	–	–	–	–
Position	**763 (287–1,405.5)**	**2,862 (1,654–4,365.5)**	**168 (114–380)**	**228 (99–385)**	**5,464 (4,010–6,067.5)**	**6,000 (5,238–7,248)**

Validity of the findings

These comments relate to your results.

PAGE 22 - -

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1. The need for statistics
2. **Presenting data**
3. Ensuring validity

Figures

- Highlighting trends, patterns and relationships

1. The need for statistics
2. **Presenting data**
3. Ensuring validity

Figures

- Highlighting trends, patterns and relationships
  - Values of time
  - Sequences of events
  - Differences between groups

1. The need for statistics
2. **Presenting data**
3. Ensuring validity

- Discussion of data
  - No interpretations of results
  - Data presentation only
- Lack of purpose
  - Specific focus for figures and tables

3. Ensuring Data is Valid

1. The need for statistics
2. Presenting data
3. **Ensuring validity**

- Be honest about your knowledge
- Confirm your expertise
- Editors can use dedicated reviewers

1. The need for statistics
2. Presenting data
3. **Ensuring validity**

- Categories grouped appropriately
- Relevance of results depends on categorisation
- Refer to similar research

1. The need for statistics
2. Presenting data
3. **Ensuring validity**

- Define statistically significant results
- Identify probability levels
- Appropriate units and rounding numbers
- Means, standard deviations and proportions

1. The need for statistics
2. Presenting data
3. **Ensuring validity**

Rainfall per Month

	2014	2015	2016	2017
Jan	6.87	4.24	4.71	5.27
Feb	5.43	5.44	3.44	4.77
Mar	5.65	5.24	4.2	5.03
Apr	5.68	4.74	5.03	5.15
May	8.78	5.11	2.7	5.53
Jun	4.32	4.59	7.59	5.50
Jul	3.55	4.82	4.92	4.43
Aug	4.33	2.94	0.76	2.68
Sep	6.87	3.35	4.71	4.98
Oct	7.65	6.73	6.01	6.80
Nov	9.65	8.91	9.35	9.30
Dec	10.45	9.44	8.44	9.44
Annual Total	79.26	65.55	61.86	68.87

1. The need for statistics
2. Presenting data
3. **Ensuring validity**

Rainfall per Month

	2014	2015	2016	2017
Jan	6.87	4.24	4.71	5.27
Feb	5.43	5.44	3.44	4.77
Mar	5.65	5.24	4.2	5.03
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Jun	4.32	4.59	7.59	5.50
Jul	3.55	4.82	4.92	4.43
Aug	4.33	2.94	0.76	2.68
Sep	6.87	3.35	4.71	4.98
Oct	7.65	6.73	6.01	6.80
Nov	9.65	8.91	9.35	9.30
Dec	10.45	9.44	8.44	9.44
Annual Total	79.25738	65.55157	61.86421	68.87621

1. The need for statistics
2. Presenting data
3. **Ensuring validity**

Rainfall per Month

	2014	2015	2016	2017	*Mean Average*	*Std. Deviation*
Jan	6.87	4.24	4.71	5.27	*5.27*	*1.15*
Feb	5.43	5.44	3.44	4.77	*4.77*	*0.94*
Mar	5.65	5.24	4.2	5.03	*5.03*	*0.61*
Apr	5.68	4.74	5.03	5.15	*5.15*	*0.39*
May	8.78	5.11	2.7	5.53	*5.53*	*2.50*
Jun	4.32	4.59	7.59	5.50	*5.50*	*1.48*
Jul	3.55	4.82	4.92	4.43	*4.43*	*0.63*
Aug	4.33	2.94	0.76	2.68	*2.68*	*1.47*
Sep	6.87	3.35	4.71	4.98	*4.98*	*1.45*
Oct	7.65	6.73	6.01	6.80	*6.80*	*0.67*
Nov	9.65	8.91	9.35	9.30	*9.30*	*0.31*
Dec	10.45	9.44	8.44	9.44	*9.44*	*0.82*
Annual Total	79.26	65.55	61.86	68.87	*68.89*	*7.48*
Mean Average	6.60	5.46	5.16	5.74	*5.74*	*1.03*
Std. Deviation	2.19	1.99	2.43	1.94	*1.94*	*0.62*

1. The need for statistics
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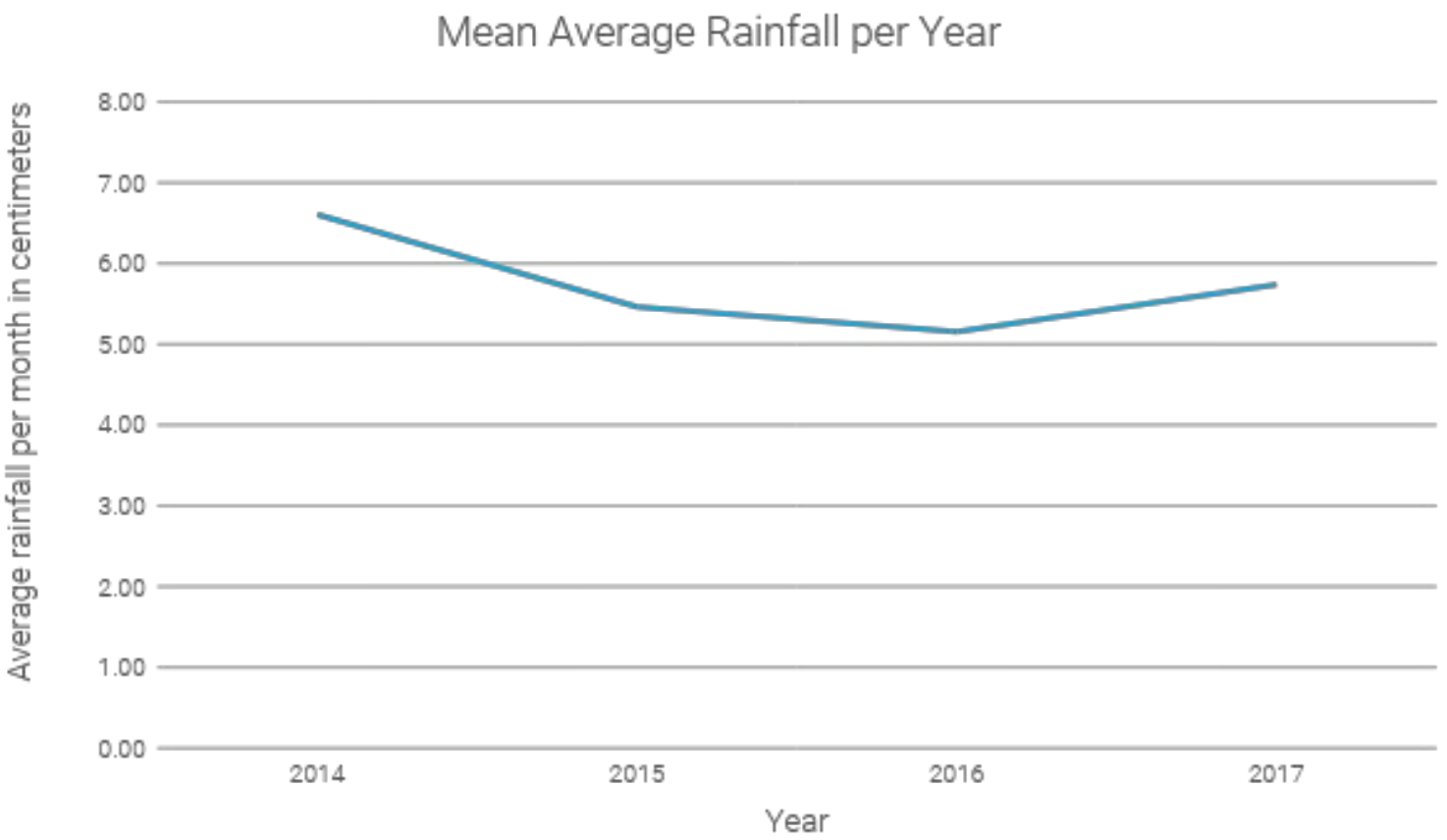
3. **Ensuring validity**



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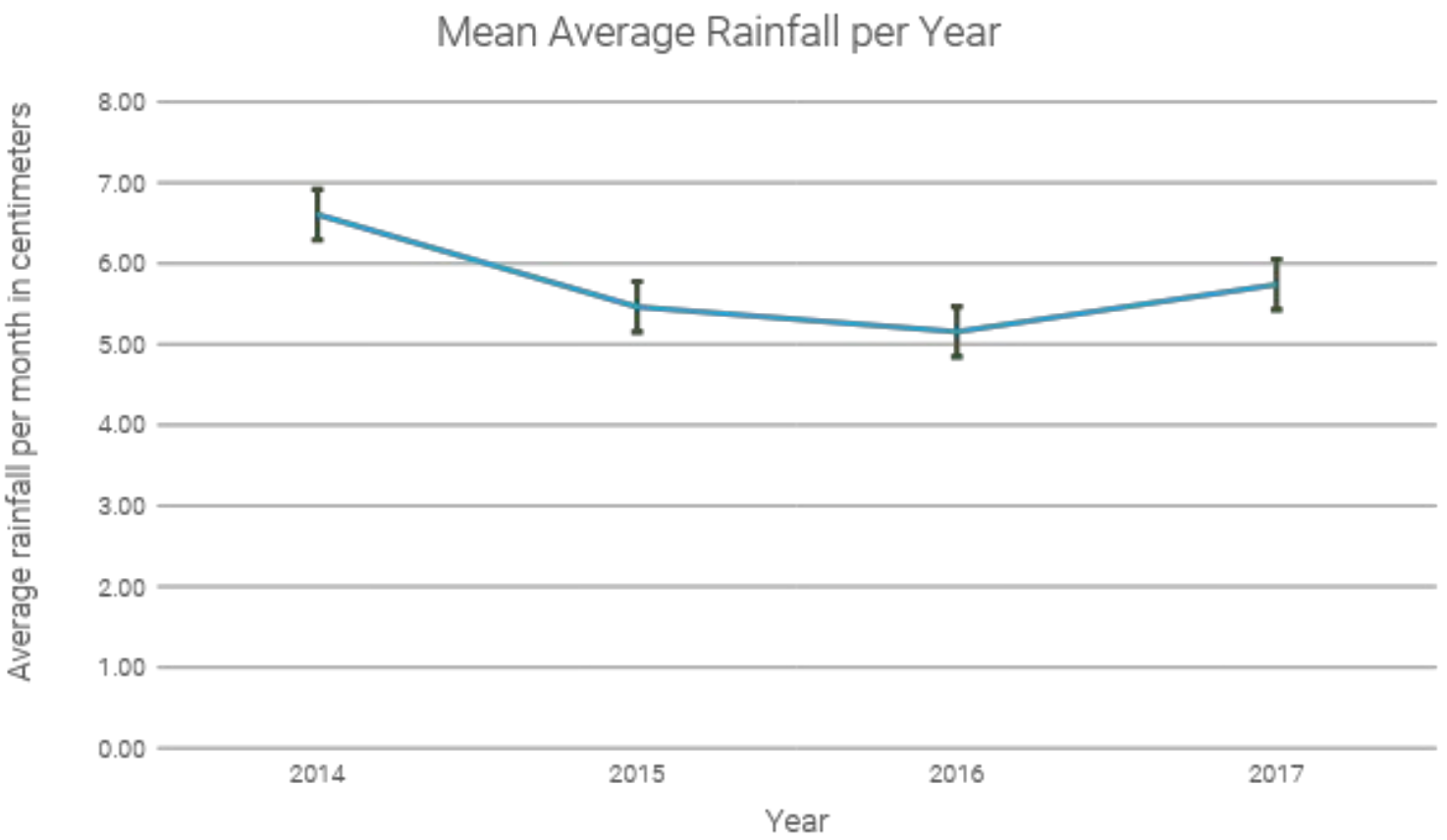

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Age Category Summary of Participants		
Age Category	Number of participants	*Percentage of participants*
0-10	35	*11%*
11-20	42	*13%*
21-30	36	*11%*
31-40	45	*14%*
41-50	35	*11%*
51-60	42	*13%*
61-70	48	*15%*
71-80	26	*8%*
80+	22	*7%*
Totals	331	*100%*
Average per group	36.8	
Std. Deviation	8.6	

1. The need for statistics
2. Presenting data
3. **Ensuring validity**

- How do authors define significance?
- What result do the authors consider effective?
- Is the threshold for significance clear?

4. Summary

Summary

- Confirm the clarity of data presentation
- Confirm data addresses the research question
- Look for focus
- Adherence to conventions
- Define statistically meaningful results