MTE-40039: Experimental Research Methodology – Statistical report

**Relevant learning outcomes**

* Demonstrate a practical understanding of statistical designs, use of power analysis and statistical procedures with which to analyse experimental data.
* Communicate findings for non-specialist audiences using simple concepts such as probability or odds.
* Make a judicious and informed selection of statistical approaches used and their relevance within the field.

**Data description**

The dataset you are given contains the results of an experiment to compare the matrix production by human chondrocytes that were grown in different scaffolds. There were three types of scaffolds (Extracel, Puramatrix and Alginate, the latter serving as a control), and each type was produced at two volume fractions: low (1%) and high (2%). The total number of conditions was therefore six. The research aimed to answer the following questions: (1) does the type of scaffold affect matrix production? (2) does changing gel density affect matrix production? and (3) does gel density affect the difference in matrix production between the types of scaffold?

For each condition, the experimental procedure was performed three times, giving a total sample size of 18 scaffolds. In each scaffold, the same number of cells was seeded. The main outcome measure of the experiments was the total amount of sulphated glycosaminoglycan (sGAG, in micrograms) in each scaffold after 14 days of culture (Table 1).

*Table 1 Amount of sGAG in each scaffold after 14 days of culture (µg)*

|  |  |  |
| --- | --- | --- |
| **Scaffold** | **Low density (1%)** | **High density (2%)** |
| Extracel | 41.3 | 44.1 |
|  | 42.7 | 44.1 |
|  | 43.4 | 46.2 |
| Puramatrix | 51.8 | 52.5 |
|  | 56.7 | 58.8 |
|  | 55.3 | 59.5 |
| Control | 39.2 | 42 |
|  | 39.9 | 43.4 |
|  | 40.6 | 44.1 |

**Analysis**

You are expected to analyse the data using SPSS or equivalent free-to-download software, for instance JASP (<https://jasp-stats.org/>) or jamovi (<https://www.jamovi.org/>). First choose an appropriate statistical analysis technique and then arrange the data in the correct form to be analysed.

**Report**

Your report (maximally 1500 words excluding tables, graphs, captions and references) should contain the following five sections and is marked based on how you addressed the three underlined elements (marks indicated between brackets):

1. **Introduction**  
   Only two or three sentences simply to state the subject and the aim, no need to come up with references  **(no marks)**.
2. **Methods**A very brief description of the experimental procedure (no more information than given above, i.e. two or three sentences; **no marks**), followed by:  
   A clear and concise description of the chosen statistical analysis technique **(20 marks)**.
3. **Results**A check of the validity of the chosen analysis method (eg if using a parametric test what must be checked to confirm validity) and a clear and concise description of the results, including appropriate graph(s) and table(s) (**40 marks**).
4. **Discussion**  
   A reasoned discussion for choosing the appropriate statistical analysis/analyses indicating the advantages and disadvantages of that/those particular technique/s including its/their validity (**40 marks**)
5. **References**  
   You might want to add references that support your choice of statistical analysis or help when indicating their advantages and disadvantages.

Remember, the submission deadline is 29 April at 14:00.