

Ordination, Principal component analysis

Quiz

The goal of quizzes is to help you learn.

Compare your answers to the list of correct answers at the end of the quiz.

Ordination – generalities

1. The primary objective of an ordination of multivariate data is to display the objects in a diagram where similar objects are together and objects with different characteristics are far apart. – True, False.
2. Ecologists use multivariate ordination methods such as PCA because the data they want to display are multivariate. – True, False.
3. An ordination method is a statistical test. – True, False.

Principal component analysis (PCA) – computation

4. Principal component analysis (PCA) can be used with variables of any mathematical types: quantitative, qualitative, or a mixture of these types. – True, False.
5. Principal component analysis (PCA) requires quantitative multivariate data. – True, False.
6. The sum of the PCA eigenvalues is equal to the sum of the variances of the variables. – True, False.
7. Variances and covariances can be computed for variables of any mathematical types: quantitative, qualitative, or a mixture of these types. – True, False.

Variable transformation

8. For variables with physical dimensions (e.g. kg), their variances also have physical dimensions. – True, False.
9. The variables subjected to PCA must all have the same physical dimensions. – True, False.
10. When the variables have different physical dimensions, they must be made dimensionless by standardization or ranging before PCA. – True, False.
11. Tables of environmental variables that have different physical dimensions must be standardized before PCA. – True, False.
12. PCA ordination diagrams are easier to interpret when the distributions of the variables are symmetrical. – True, False.
13. For community composition data, the Hellinger and chord transformations are appropriate before PCA. – True, False.

PCA biplots

14. PCA biplots are graphs in which objects and variables (descriptors) are represented together. – True, False.
15. In PCA, distance biplots (scaling 1) correctly represent the positions of the objects with respect to one another, projected in 2 dimensions. – True, False.
16. In PCA, correlation biplots (scaling 2) correctly represent the angular relationships among the variables, projected in 2 dimensions. – True, False.
17. Groups of similar sites can be identified on distance biplots (scaling 1). – True, False.
18. Intercorrelated groups of species can be identified on correlation biplots (scaling 2). – True, False.

Equilibrium circle of descriptors

19. An equilibrium circle of descriptors can be drawn on PCA distance biplots (scaling 1). – True, False.
20. An equilibrium circle of descriptors can be drawn on PCA correlation biplots (scaling 2). – True, False.

Meaningful components, algorithms

21. The most meaningful and interpretable principal components are those that have the largest eigenvalues. – True, False.
22. The broken-stick model is often used as a null model against which one can assess the eigenvalues, in order to determine the most important eigenvalues and how many PCA axes one should examine and plot. – True, False.
23. Eigen decomposition, singular value decomposition (SVD) and iterative search of eigenvalues and eigenvectors are three different ways of computing PCA. They produce the same PCA results. – True, False.
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Correct answers to the questions about PCA –

1. True

2. True

3. False

4. False

5. True

6. True

7. False

8. True

9. True

10. True

11. True

12. True

13. True

14. True

15. True

16. True

17. True

18. True

19. True

20. False

21. True

22. True

23. True

