Materials Design Analysis Reporting (MDAR) Checklist for Authors

The MDAR framework establishesa minimum set of requirements in transparent reporting applicable to studies in the life sciences (see Statement of Task: doi:10.31222/osf.io/9sm4x.). The MDAR checklist is a tool for authors, editors and others seeking to adopt the MDAR framework for transparent reporting in manuscripts and other outputs. Please refer to the MDAR Elaboration Document for additional context for the MDAR framework.

Materials

Antibodies	Yes (indicate where provided:section/paragraph)	n/a
For commercial reagents, provide supplier name, catalogue number and RRID, if available.	Yes， **Methods/paragraph 6,8,9,10,11**	

Cell materials	Yes (indicate where provided:section/paragraph)	n/a
Cell lines: Provide species information, strain. Provide accession number in repository **OR** supplier name, catalog number, clone number, **OR** RRID	Yes， **Methods/paragraph 6**	
Primary cultures: Provide species, strain, sex of origin, genetic modification status.	Not used in research	**n/a**

Experimental animals	Yes (indicate where provided:section/paragraph)	n/a
Laboratory animals: Provide species, strain, sex, age, genetic modification status. Provide accession number in repository **OR** supplier name, catalog number, clone number, **OR** RRID	Not used in research	**n/a**
Animal observed in or captured from the field: Provide species, sex and age where possible	Not used in research	**n/a**
Model organisms: Provide Accession number in repository (where relevant) **OR** RRID	Not used in research	**n/a**

Plants and microbes	Yes (indicate where provided: section/paragraph)	n/a
Plants:provide species and strain, unique accession number if available, and source (including location for collected wild specimens)	Not used in research	**n/a**
Microbes:provide species and strain, unique accession number if available, and source	Not used in research	**n/a**

Human research participants	Yes (indicate where provided:section/paragraph)	n/a
Identify authority granting ethics approval(IRB or equivalent committee(s), provide reference number for approval.	Yes， **Methods/paragraph 3**	
Provide statement confirming informed consent obtained from study participants.	Yes， **Methods/paragraph 3**	
Report on age and sex for all study participants.	Yes, Table 1 and **Results/paragraph 2**	

Design

Studyprotocol	Yes (indicate where provided:section/paragraph)	n/a
For clinical trials, provide the trial registration number **OR**cite DOI in manuscript.		**n/a**

Laboratoryprotocol	Yes (indicate where provided:section/paragraph)	n/a
Provide DOI or other citation details if detailed step-by-step protocols are available.	Not used in research	**n/a**

Experimental study design (statistics details)	Yes (indicate where provided:section/paragraph)	n/a
State whether and how the following have been done**, or** if they were not carried out.		**n/a**
Sample size determination	Not used in research	**n/a**
Randomisation	Not used in research	**n/a**
Blinding	Not used in research	**n/a**
Inclusion/exclusion criteria	Not used in research	**n/a**

Sample definition and in-laboratory replication	Yes (indicate where provided:section/paragraph)	n/a
State number of times the experiment was replicated in laboratory	Yes, **Figure legends**	
Define whether data describe technical or biological replicates	Yes, **Methods/paragraph16** and **Figure legends**	

Ethics	Yes (indicate where provided: section/paragraph)	n/a
Studies involving human participants: State details of authority granting ethics approval (IRB or equivalent committee(s), provide reference number for approval.	Yes, **Methods/paragraph 3**	
Studies involving experimental animals: State details of authority granting ethics approval (IRB or equivalent committee(s), provide reference number for approval.	Not used in research	**n/a**
Studies involving specimen and field samples: State if relevant permits obtained, provide details of authority approving study; if none were required, explain why.	Yes, **Methods/paragraph 3**	

Dual Use Research of Concern (DURC)	Yes (indicate where provided:section/paragraph)	n/a
If study is subject to dual use research ofconcern, statethe authority granting approval and reference number for the regulatory approval	Not used in research	**n/a**

Analysis

Attrition	Yes (indicate where provided:section/paragraph)	n/a
State if sample or data point from the analysis is excluded, and whether the criteria for exclusion were determined and specified in advance.	Not used in research	n/a

Statistics	Yes (indicate where provided:section/paragraph)	n/a
Describestatistical tests used and justify choice of tests.	Yes, **Methods/paragraph16**	

Data Availability	Yes (indicate where provided:section/paragraph)	n/a
State whether newly created datasets are available, including protocols for access or restriction on access.	Not used in research	n/a
If data are publicly available, provide accession number in repository or DOI or URL.	Yes, **Methods/paragraph1-2 and Methods/paragraph14**	
If publicly available data are reused, provide accession number in repository or DOI or URL, where possible.	Yes, **Methods/paragraph1-2 and Methods/paragraph14**	

Code Availability	Yes (indicate where provided:section/paragraph)	n/a
For all newly generated code and software essential for replicating the main findings of the study:	Not used in research	n/a
State whether the code or software is available.	Yes,**Methods/paragraph1-2 and Methods/paragraph14-16**	
If code is publicly available, provide accession number in repository, or DOI or URL.	Yes,**Methods/paragraph1-2 and Methods/paragraph14-16**	

Reporting

Adherence to community standards	Yes (indicate where provided: section/paragraph)	n/a
MDAR framework recommends adoption of discipline-specific guidelines, established and endorsed through community initiatives. Journals have their own policy about requiring specific guidelines and recommendations to complement MDAR.		
State if relevant guidelines (eg., ICMJE, MIBBI, ARRIVE) have been followed, and whether a checklist (eg., CONSORT, PRISMA, ARRIVE) is provided with the manuscript.	ICMJE guidelines were followed, as the journal follows ICMJE recommendations for publication.	

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