STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

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|  | Item No | Recommendation | Page No |
| **Title and abstract** | 1 | 1. Indicate the study’s design with a commonly used term in the title or the abstract   *a cross-sectional study* | 1 |
| 1. Provide in the abstract an informative and balanced summary of what was done and what was found   *This research used a simple random sampling technique to select a sample and conduct a cross-sectional survey. To present how the appropriateness of the lighting systems in art galleries and exhibition spaces can enhance human visual quality and comfort, visual performance and the relationship between lighting system design and human visual comfort of users.* *Limitations include that analyses were cross-sectional and thus may not deduce causal directions, and the authors based the result on self-report.* | 1 |
| Introduction | | | |
| Background/rationale | 2 | Explain the scientific background and rationale for the investigation being reported  *The increasing of visual performance and visual comfort can be achieved from technical understanding on the luminaire type, angle and position. The issues on reflective glare and shadow can be avoided by better understanding of the light’s technique and specification. Lighting is essential for the gratification of art and spatial impression. Art galleries showcase artists’ ideas and inner thoughts in any form and capacity through the visual quality of art displayed. The interaction between the lighting system and visual feeling significantly affects how humans perceive the world. Maintaining and sustaining visual quality in a space is essential to helping perception. Maintaining visual quality/comfort in space involves being aware and mindful of the type, colour and amount of light. Lamentably, existing literature shows the quality of visual perception against the overall aesthetics of the art gallery exhibition space. The study aims to help researchers understand the relationship between lighting systems in art galleries/exhibition space design and human visual quality/comfort.* | 1-3 |
| Objectives | 3 | State-specific objectives, including any prespecified hypotheses   1. *Assessment of the socio-economic and demographic characteristics of the users of the art gallery* 2. *Identify the available lighting system applications in an art gallery and appropriateness level of these lighting strategies* 3. *Factors for enhancing Human visual quality and visual comfort based on lighting* | 1 & 11 |
| Methods | | | |
| Study design | 4 | Present key elements of study design early in the paper  *(1). Participants (artists, architects, lighting experts, workers and visitors)*  *(2). Sample (Nike, Hourglass and Nimbus Art Gallery),*  *(3). Sampling (Simple random sampling)*  *(4). Manoeuvre*  *(5). Result/Outcomes and*  *(6). Study methods (a cross-sectional study)* | 6-9 |
| Setting | 5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection  *The researchers developed and distributed an on-ground (field) survey questionnaire to building art gallery users (architects, lighting experts, visitors, artists and workers). Consequently, two research assistants covered three case studies (Nike Art Gallery, Hourglass Art Gallery and Nimbus Art Gallery) in Lagos, Nigeria, to acquire responses in person. The investigator covered the first two galleries, and the research assistant covered one gallery. The questions were structured to gather information about the socio-demographics of the survey respondents and their perceptions of how the existing lighting design in the spaces enhances the visual quality/comfort of the users. The information to be retrieved included the art forms within the art galleries and the opinions of the informed and uninformed (regarding lighting in art galleries) on the appropriateness and importance of different lighting systems and strategies.*  *The authors extracted data through a semi-structured questionnaire from the one hundred and five respondents who completed the questionnaires. The authors selected thirty (30) respondents from the Nike art gallery, fifty-five (55) from the Hourglass art gallery and twenty-five (25) respondents from the Nimbus Art Gallery, all within Lagos, Nigeria. The survey was conducted on the ground using semi-structured questionnaires by two M.Sc. architecture students from July to September 2022. Respondents were to complete a questionnaire comprising nine (9) questions about respondents’ socio-economic status, ten (10) questions about lighting design in an art gallery and seven (7) questions to measure visual quality/comfort characters in an art gallery exhibition space. The 26 questions were adopted from previous studies. The research assistant undertook the main data gathering for three months –morning and evening, during the weekend, Fridays - and Sundays for twelve weeks.* | 7-8 |
| Participants | 6 | (*a*) Give the eligibility criteria and the sources and methods of selection of participants   * *The authors used a Convenience Sampling method to select the participants in Lagos (i.e. 2-Lagos Island and 1-Lagos Mainland).* * *The authors used Purposive sampling selection to pick three (3) out of several case study of art galleries in Lagos (Island and Mainland).* * *Through Quota sampling selection, the researcher picked a size able art gallery users from the three (3) already selected case studies based on the capacity.* * *The researcher employed simple random sampling selection to pick these users of art galleries across the three case studies (Nike art gallery-30, Hourglass art gallery-55 and Nimbus Art Gallery-25).* | 7-8 |
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable |  |
| Data sources/ measurement | 8\* | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe the comparability of assessment methods if there is more than one group   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | ***S/N*** | ***Types of Variables*** | | ***Data Representation*** | ***Examples*** | ***Sources Of Data*** | | *1.* | *Quantitative variables* | *Discrete Variable* | *Counts of individual items or values.* | *Number of users- artists, architects, lighting experts, workers and visitors* | *surveys, and fieldwork.* | |  | *Continuous Variable* | *Measurements of continuous or non-finite values.* | *ages of participants*  *distances of the spaces* | *surveys, and fieldwork.*  *Photographs, drawings,* | | *2.* | *Categorical variables* | *Nominal Variables* | *Groups with no rank or order between them.* | *Colours, light in the spaces* | *Observation*  *Photographs, drawings, and posters.*  *Works of art and literature.* | |  | *Ordinal variables* | *Groups that are ranked in a specific order.* | *The Likert scale used in the attitudinal data collected throughout the research* | *surveys.* | |  |
| Bias | 9 | *Describe any efforts to address potential sources of bias*  *Therefore, for this study, the effort to control potential sources of bias included: the researchers creating a thorough research plan, using an appropriate statistical method, defining a target population and a sampling frame, employing simple random sampling for data collection, avoiding convenience sampling, accounted for dropouts or missing data, obtained complete data, avoided generalisation, placed interview or survey topics into separate categories, created data analyst blinding, intention-to-treat analysis, maintained detailed records, completed reporting of all prespecified outcomes.* | 5. |
| Study size | 10 | Explain how the study size was arrived at  *The study size was arrived at through*  *i. Setting and location Lagos, Nigeria choosing Lagos Island based on Consecutive sampling.*  *ii. Lagos Island in Lagos with all the concentrations of art galleries in Lagos.* | 7. |
| Quantitative variables | 11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why  *The article provides data drawn from users of art galleries in Lagos. The data instrument used for the study is the questionnaire, which includes open and close-ended questions with variables measured on the 5-point Likert scale. One hundred and five out of one hundred and twenty questionnaires administered to the users of art galleries in Lagos, Nigeria, were returned completed. The questionnaire utilised can be Supplementary material. The questionnaire survey employed two M.Sc. students to cover three art galleries in Lagos, Nigeria. SPSS version 21 (RRID: SCR\_002865) codes and analyses the data. The data analysis used descriptive statistics, such as mean, percentages, and frequency.* | 11. |
| Statistical methods | 12 | (*a*) Describe all statistical methods, including those used to control for confounding  *The study determines how lighting systems enhance users’ visual comfort/quality in an art gallery in Lagos, Nigeria* through descriptive statistical analysis of the 5-point Likert scale. The result was illustrated in charts, screen plots, and graphs. | 11 |
| (b) Describe any methods used to examine subgroups and interactions  ***Observation guide:****to record all the elements, indoor space, Lighting, and artifacts in the art galleries*  ***a Checklist*** *to identify lighting types and quality in the selected Art gallies.* | 11 |
| 1. Explain how missing data were addressed   *Well, I am not sure how the data got missing, but Table 1 shows the distribution of the questionnaire (i.e. number administered, and number retrieved).*  *However, the users of art galleries in Lagos are aged 15-40. Hence, the focus is the population of people within these age brackets in Lagos in 2022. And since Lagos is into two (2) subdivisions – mainland and Island. The research chose Lagos Island because all the major art galleries are there. However, the population of Lagos Island in 2022 is 314,900 people. The population of ages 15-40 in Lagos Island in 2022 is 113,232.96, and a simple random sampling strategy can allow a subset sample chosen at random of the population to be representative of the entire population. Therefore, the investigators took a percentage of the population (113,232.96) as a representative subset of users and distributed 150 semi-structured questionnaires across the three purposively selected case studies (art galleries) in Lagos Island. The investigators considered the number of patronages (users) based on the information gathered from the different curators and owners of art galleries. In the end, only 105 questionnaires out of 150 were completed and returned. So, I suppose the data lost was between the interval of administration and retrieval.* |  |
| (*d*) If applicable, describe analytical methods taking account of the sampling strategy  *N/A* |  |
| (*e*) Describe any sensitivity analyses  *N/A* |  |
| Results | | | |
| Participants | 13\* | (a) Report numbers of individuals at each stage of study—e.g. numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed.  ***Participants for Survey***  *150 questionnaires among the users (architects, lighting experts, visitors, artists and workers) of three art galleries within the study areas.* | 8 |
| (b) Give reasons for non-participation at each stage  N/A |  |
| (c) Consider the use of a flow diagram  N/A |  |
| Descriptive data | 14\* | (a) Give characteristics of study participants (e.g. demographic, clinical, social) and information on exposures and potential confounders  *characteristics of Participants*   1. *Demographic- The participants in this study were about 105 for the survey* 2. *Social: The participants were architects, lighting experts, visitors, artists and workers who were art enthusiast.* | 8 |
| (b) Indicate the number of participants with missing data for each variable of interest   * *zero participants with missing data in Nike Art Gallery, Lagos Island, Lagos.* * *22 participants with missing data in Hour Glass Art Gallery, Lagos Island, Lagos* * *23 participants with missing data in Nimbus Art Gallery, Lagos mainland, Lagos* | 8 |
| Outcome data | 15\* | Report numbers of outcome events or summary measures  *1. The outcome data characterise the socio-economic and demographic characteristics of art gallery/exhibition space users in Lagos, Nigeria, and their perceptions regarding visual quality/comfort. This information helps fill a knowledge gap regarding the specific context of art gallery service and lighting system adoption in Nigeria.*  *2. The outcome data may establish a correlation between the design of lighting systems in an art gallery and human visual quality/comfort among users.*  *3. The outcome data offers a generalisability for studies in countries with similar culture and economic dynamics, social systems and relaxation cultures to provide a better and more diverse indulgence of the interplay between lighting-related factors and human visual comfort issues.*  *4. The data contributed to the knowledge of how lighting systems in an art gallery/exhibition space influence human visual quality/comfort among users, potentially affecting artefact preservation.* |  |
| Main results | 16 | (*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included  *N/A* |  |
| (*b*) Report category boundaries when continuous variables were categorized  *N/A* |  |
| (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period  *N/A* |  |
| Other analyses | 17 | Report other analyses done—e.g. analyses of subgroups and interactions and sensitivity analyses  ***Observation guide:****to record all the elements, indoor space, Lighting, and artifacts in the art galleries*  ***a Checklist*** *to identify lighting types and quality in the selected Art gallies* |  |
| Discussion | | | |
| Key results | 18 | Summarise key results with reference to study objectives   1. *Predisposition toward art galleries from the study demography favours the young population because many youths under 21 and above (15-40) are artistic, and visiting an art gallery, museum, or installation can inspire them to pursue an art career. Hence, we identified the young population during our visit to the three case studies (the three art galleries in Lagos Island, Lagos, Nigeria).* 2. *The study identifies that the appropriateness of the lighting systems in art galleries is vital in enhancing and determines level of human visual quality and comfort and measure visual performance and visual comfort.* 3. *The study presented seven factors for enhancing visual quality/comfort in art galleries as access to views of the outside, daylight provision in sufficient quantity, uniform lighting distribution, good combination of daylight and artificial light, adequate task lighting, control to ensure the absence of glare and high contrasts, and an aesthetically pleasing space.* | 11- |
| Limitations | 19 | Discuss the limitations of the study, taking into account sources of potential bias or imprecision. Discuss both the direction and magnitude of any potential bias  *The authors provide more detail about the additional data they collected to tackle the problem of information bias and Selection bias. Specifically, we ensure prevention of****questionnaire biases****under information bias and****response biases****under selection bias. This we did to ensure internal and external validity of a study. We also set up quality control programs for data collection to keep variability at a minimum because we used multiple observers. Again, we discuss the imprecision of the results due to study size and the measurement of outcomes. The authors compared this study titled:****“Enhancing Human Visual Comfort of the Lighting System in an Art Galleries Design, Lagos, Nigeria”****with other studies in the literature in terms of validity, generalizability and precision, see page pages 25 and 26 in the original manuscript.* | 25-26 |
| Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, the multiplicity of analyses, results from similar studies, and other relevant evidence  *In the discussion section, the authors attempted to give an interpretation of a study’s results. The authors used an objective assessment of the findings from the three (3) study objectives. In interpreting results, the authors consider the nature of the study and potential sources of bias, including a loss to follow-up and non-participation of respondents. We also considered confounding (“mixing of effects”), the results of relevant sensitivity analyses, and the issue of multiplicity and subgroup analyses. We also considered residual confounding due to unmeasured variables or imprecise measurement of confounders. The authors address the range of uncertainty in estimates, which is larger than the statistical uncertainty reflected in confidence intervals. Statistical uncertainty does not consider other uncertainties that arise from a study’s design, implementation, and methods of measurement.* |  |
| Generalisability | 21 | Discuss the generalisability (external validity) of the study results  *Every art gallery and exhibition project should begin with a review of existing literature on design interventions to improve users’ outcomes, staff effectiveness and users’ safety, artifacts preservation, users' decisions on the project, and expected outcomes/benefits. Checklists can assist designers and users in evaluating existing conditions and in setting goals for new facilities planning and design. Design goals set and clearly defined at the beginning of a project can serve as research questions to be answered by post-occupancy surveys, data collection, and evaluation. Early art gallery and exhibition organizations’ operational model process alignment with the design goals creates a positive collaborative, emotionally, spiritually, educative and socially supportive environment. Research plays a vital role in helping us continue to understand the art gallery and exhibition environment's effects better and identifying opportunities to make it preservation and an active agent for education and entertainment. Three kinds of research are the Art Model, which evaluates environmental impacts using measurable data; the Social Science Model, which evaluates user perception and behaviour; and the Holistic Model, which embraces an organisation and its facility. Lighting system and human visual quality/comfort checklist from this study has identified seven factors in gallery and exhibition environment design that can measurably improve users’ comfort and artifacts preservation outcomes, which include – 1. access to views of the outside, 2. daylight provision in sufficient quantity, 3. uniform lighting distribution, 4. good combination of daylight and artificial light, 5. adequate task lighting, 6. control to ensure the absence of glare and high contrasts, and 7. an aesthetically pleasing space* | 25-26 |
| Other information | | | |
| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based  *N/A* |  |

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.