Replication of a Research Claim from O'Brien & Noy (2015),
from *American Sociological Review*.

Replication Team: Marco Ramljak and Erick Axxe

Research Scientist: Melissa Kline

Action Editor: John Lloyd

Independent Reviewers
(add name below when you initiate review, comment "DONE" on your name when you finish):

Reviewer #1: [Jan Philipp Röer]

Reviewer #2: Hansika Kapoor]

Reviewer #3:Scott Braithwaite

Review Period: September 14 - September 21

View-only links to: Original Paper, Replication Data, Replication Analysis

Privacy Statement: Other teams are making predictions about the outcomes of many different studies, not knowing which studies have been selected for replication. As a consequence, the success of this project requires full confidentiality of this peer review process. This includes privacy about which studies have been selected for replication and all aspects of the discussion about these replication designs.

Instructions for Data Analysts

The preregistration for this replication study was started by a separate team of researchers who were responsible for identifying data sources and constructing them into a replication dataset(s) for your use in the analysis. They have completed sections 1-13 of the preregistration below, and included additional materials in the OSF project that document how the dataset was constructed.

In cases where all of the underlying data sources were able to be freely shared and posted, the constructed dataset(s) have been posted to the OSF as well, which you are free to use in designing the analysis plan (see below for details). In cases where some or all of the data sources could *not* be freely shared or posted, the replication dataset(s) are not provided on the OSF. Rather, you will need to follow the instructions and code to first reconstruct the datasets, and then proceed with your work. In such cases, the team responsible for creating the dataset(s) has provided summary statistics in the OSF that correspond to the constructed datasets, so you can verify that the datasets you create match what they intended.

You'll be responsible for filling out sections 16-25 of the preregistration below. Before you do so, **please review the original study, sections 1-15 of the preregistration, and the materials provided on the OSF**, so that you are familiar with all of the decisions that have been made to date. In many cases, the 'data preparer' will have left you instructions and suggestions on how the provided data can be used in the analysis, as well as idiosyncrasies and discrepancies in the data that you should be aware of. The data preparers have tried to be thorough in including all variables that you might need, but please keep in mind the following:

- Some of the variables included in the constructed dataset(s) may not be needed in the final analysis, so please do not feel the need to necessarily use all of the provided variables.
- Some of the variables needed might have mistakenly been excluded from the constructed datasets. If you find that this is the case, please let Andrew or Anna know, and they will work with you to supplement the datasets as needed.

For these secondary data replications, we would like the analysis plan to be completed before the preregistration goes through review, so that after review, the only remaining steps are registration and running the analysis code on the full datasets. To facilitate that, we are asking that you include in section 19 a link to the code you will use that takes the constructed dataset(s) provided to you and produces the focal analysis (including all of the cleaning, merging, and transforming required). When developing your analysis plan and code, please randomly sample 5% of the data for use in your work, and **do not use the rest of the data until after your study is registered and it is time to run the final analysis**. In section 19, you will find a statement that we are asking you to bold that confirms you've only used 5% of the data when developing and testing your code. If this approach will not work for any reason, please let Andrew or Anna know and disclose deviations from this plan somewhere in the preregistration.

- In cases where we are providing you a complete dataset, you can just sample out 5% of the observations and hold the rest out until you are ready to perform the final analysis.
- In cases where we are providing you multiple datasets that need to be combined prior to analysis, please sample out 5% of the observations in whatever way is most sensible.
    - For example, in cases where each dataset contains complete observations on its own (a typical 'row bind' situation), it makes the most sense to sample out 5% of each dataset separately and then combine them together to develop and test your code.
    - In cases where datasets need to be merged in order to create complete observations (a typical 'column bind' situation), it makes the most sense to merge the separate datasets

into a full dataset first, and then sample out the 5% before proceeding with the rest of the analysis code.

- We leave the decision on how to sample out the random subset of data to you, so long as (a) you are not performing any analyses on the complete dataset until after your study is registered and (b) whatever decision you make is documented in the preregistration.

Finally, in cases where the replication data combines observations from the original study with observations that were not used in the original study (what we are calling 'hybrid replications'), please perform up to three analyses (details immediately below). This will likely require you to subset your data, based on the description of the original analysis provided in the study.

- When the 'new' data alone can clear the minimum power threshold, please perform three analyses: one analysis that only uses observations that were **not** used in the original analysis; one analysis that combines all available observations; and a third analysis that only uses observations that **were** used in the original analysis. Please make sure all three analyses are documented (with code) in section 19 below.
- When the 'new' data alone *cannot* clear the minimum power threshold, please perform one analysis that combines all available data, and a second that only uses the old data. Please make sure both analyses are documented (with code) in section 19 below.

Please contact Andrew or Anna if you have any questions. After you've completed the remaining sections of the preregistration and uploaded all the necessary materials to the OSF, please contact the SCORE coordinators regarding next steps.

Preregistration of O'Brien_AmSocioRev_2015_7X54

Existing Data Replication

Study Information

1. Title (provided by SCORE)

RR TEAM INSTRUCTIONS: *This has been determined by SCORE.*

Replication of a research claim from O'Brien & Noy (2015) in *American Sociological Review*.

2. Authors and affiliations

RR TEAM INSTRUCTIONS: *Fill in the names and affiliations of your team below.*

Marco Ramljak[2]
Erick Axxe[1]

The Ohio State University 1
Utrecht University 2

3. Description of study (provided by SCORE)

RR TEAM INSTRUCTIONS: *This description has been provided by SCORE. Please review and make a SCORE project coordinator aware of any edits, additions, and corrections you would suggest to the paragraph. You are free to add additional descriptions of your project in a separate paragraph.*

The claim selected from O'Brien & Noy (2015) is that, although the post-secular perspective entails high levels of science knowledge as well as favorable views of science and religion, when scientific and religious perspectives conflict (e.g. evolution), the post-secular latent class almost unanimously aligned their views with particular religious accounts. This reflects the following statement from the paper's abstract: "Overall, most individuals favor either scientific or religious ways of understanding, but many scientifically inclined individuals prefer certain religious accounts." Participants' responses to the General Social Survey (GSS) were submitted to a latent class analysis that resulted in a three-class solution characterized as representing traditional, modern, and post-secular perspectives on science and religion. Following this assignment, two-tailed t-tests were used to compare responses between the three groups; for the purposes of the SCORE project, the focal test is the comparison between the Traditional and Post-Secular groups on the question concerning evolution ('Human beings developed from

earlier species of animals', yes or no). Members of the post-secular category were significantly less likely than members of the traditional group to respond that humans evolved from other animals (3 percent, significant at $p < 0.05$ on a two-tailed test, see Table 2, rightmost column).

4. Hypotheses (provided by SCORE with possible Data Analyst additions)

RR TEAM INSTRUCTIONS: *The focal test for SCORE is indicated as H*. If you will test additional hypotheses (or use alternate analyses) that help you to evaluate the claim your replication/reproduction is testing, number them H1, H2, H3 etc. (You can place H* in the list wherever makes sense). Please make sure that any additional hypotheses are logical deductions/operationalizations of the selected SCORE claim or are necessary to properly interpret the focal H* hypothesis. Research that is outside this scope should be described in a separate preregistration.*

Specific points to keep in mind (please also consult the Reviewer Criteria):

- *Are the listed hypotheses specific, concise, clearly testable, and specified at the level of operationalized variables?*
- *Are hypotheses identified as directional or non-directional, and, if applicable, have the direction of hypotheses been stated? (Example: "Customers' mean choice satisfaction will be higher in the CvSS architecture condition than in the standard attribute-by-attribute architecture condition.")*
- *Does the list of hypotheses/tests indicate whether additional hypotheses are taken from the original study or modified/added by the team?*

H*: Respondents with a post-secular perspective on science and religion will be less likely than respondents with a traditional perspective on science and religion to respond that humans evolved from other animals.

Design Plan

5. Study type

NOTE: *The study type selected should be based on the data collected for the replication, and not necessarily the data used in the original study.*

- Experiment - A researcher randomly assigns treatments to study subjects, this includes field or lab experiments. This is also known as an intervention experiment and includes randomized controlled trials.
- **Observational Study - Data is collected from study subjects that are not randomly assigned to a treatment. This includes surveys, natural experiments, and regression discontinuity designs**.
- Meta-Analysis - A systematic review of published studies.
- Other

6. Blinding

RR TEAM INSTRUCTIONS: *Select any/all of the below that apply for your study by bolding them. You will give a longer description in the next question.*

- **No blinding is involved in this study.**
- For studies that involve human subjects, they will not know the treatment group to which they have been assigned.
- Personnel who interact directly with the study subjects (either human or non-human subjects) will not be aware of the assigned treatments. (Commonly known as “double blind”)
- Personnel who analyze the data collected from the study are not aware of the treatment applied to any given group.

[QUESTION 6 - BOLD YOUR RESPONSE ABOVE]

7. Blinding

RR TEAM INSTRUCTIONS: *Since all existing data replications are based on data that has already been collected, in most cases it will not be necessary to comment on participant blinding. In the rare instance when an existing experiment is being re-analyzed for an existing data replication and blinding is a relevant consideration, please provide below any details regarding blinding that are important for a reviewer to be aware of.*

No blinding was involved to the secondary data collectors’ knowledge.

8. Study Design

RR TEAM INSTRUCTIONS: *Please describe how data was collected in the original study and how it compares to the data that was selected for the replication attempt. Explain why the data selected for the replication study is suitable for a replication and if any substantial deviations exist between the two.*

If the data used in the replication combines observations from the original study with new observations (e.g. if the data selected for the replication attempt comes from the same longitudinal survey as the original study), describe how 'original' and 'new' observations relate to each other and an estimate for what proportion of the final dataset's observations will be comprised of original vs. new observations.

Specific points to keep in mind (please also consult the Reviewer Criteria):

- *Does the preregistration specify the unit of analysis?*
- *Does the preregistration provide sufficient detail about how the data selected for the replication attempt deviates from or is congruent with the data employed in the original study?*
- *Does the preregistration describe whether and how 'original' and 'new observations' are combined together for the replication dataset?*

The original study utilizes standardized, representative data from the General Social Survey (GSS) - one of the largest biennial public opinion surveys in the USA. It inhibits core modules (questions asked in every wave) and special modules (topical questions asked only in certain waves). The original study uses the waves from 2006, 2008 and 2010.

All questions needed to replicate the focal claim are entailed in core modules, therefore available for every forthcoming wave, from the point of view of the original study. Therefore, the forthcoming waves (2012, 2014, 2016, 2018) can all be utilized for potential replication. The replication can either be carried out only for the forthcoming waves or with a combined dataset (2006, 2008, 2010, 2012, 2014, 2016, 2018) as the questions are standardized. It can be concluded that there are no serious deviations present in the potential replication dataset compared to the dataset from the original study, concerning the relevant variables needed for the focal claim.

It should be noted that the original study conducts a latent class analysis in which a 3 level latent variable is developed by "clustering" certain variables. This latent variable is used to differentiate three classes concerning the variables that are used for clustering. The focal claim is only interested in one of these variables and its distribution concerning the levels of the latent variable. Therefore, even though at the end the focal claim is only interested in one of the

variables, to replicate the analysis to a sufficient degree, all so called manifest variables are still needed. Therefore, all manifest variables will be listed in the following.

9. Randomization (free response)

RR TEAM INSTRUCTIONS: *If the variables used for this replication attempt were randomized, state how they were randomized, and at what level.*

No variables for this study have been randomly assigned.

Sampling Plan

This section describes how the data sources for the replication were selected, how they were prepared into a replication dataset, and the number of observations that will be analyzed from these data. Please keep in mind that the data described in this section are the actual data used for analysis, so if you are using a subset of a larger dataset, please describe the subset that will actually be used in your study.

10. Existing data (multiple choice question, provided by SCORE)

1.1.1. Registration prior to creation of data
1.1.2. Registration prior to any human observation of the data
1.1.3. Registration prior to accessing the data
1.1.4. Registration prior to analysis of the data
1.1.5. Registration following analysis of the data

11. Explanation of existing data

NOTE: *For replications that rely on existing data sources, this question refers to the data that will be used for the replication analysis (i.e. the final replication dataset), and not (a) the data from the original study or (b) the data sources accessed to construct the replication dataset. Since no new data will be created for 'existing data replications,' 1.1.1 should never be selected. Since all analyses will occur after registration, 1.1.5 should also never be selected.*

The final dataset for replication has been accessed, and cleaned to a very low degree prior to registration. All subsequent waves of the GSS (reference point: the waves used in the original dataset) were chosen because the necessary variables were available in all of them. The selected variables in the final dataset are the same ones that were used in the original study.

None of the variables were selected because of their likelihood (or not) of leading to a confirmatory result.

12. Data collection procedures

RR TEAM INSTRUCTIONS: *Please describe the process for constructing the replication dataset in as much detail as you can. The sections below should be used to provide the following information:*

- *Which variables are needed from the original study to perform a good-faith, high-quality replication.*
- *Which data sources were used, why they were selected, any deviations between the original study design and the replication study design that these selections present, and the procedures used to access the data.*
- *Which of the variables from the original study are available in the replication data sources, including relevant details about each measure.*
- *The procedure for creating the replication dataset, in both narrative and script form.*
- *A data dictionary that documents each variable included in the replication dataset.*

In the sections below, please provide links to the original materials whenever possible -- including descriptions of the original datasets and corresponding codebooks. If materials can be shared on the OSF, please do so, and provide view-only links to those materials.

Specific points to keep in mind for reviewers:

- *Does the preregistration describe which data sources were selected for the replication study and why each is suitable?*
- *Does the preregistration make clear how the data sources were used to construct the replication dataset?*

(a) Data Needed

RR TEAM INSTRUCTIONS: *List below the datasets and variables the original author used to analyze the focal claim. Include details regarding the sample size, waves or years used, and other details pertinent to finding an existing dataset for replication. Please include page numbers when excerpting from the original article. If possible, categorize the list of variables as one of the following: dependent variable, focal independent variable, control variable, or sample parameters/clustering variable. Finally, include the sample size of the original study's focal analysis, if it is available.*

The variables needed for replication are so-called manifest variables. A list can be found in Table 1 of the online supplementary (https://journals.sagepub.com/doi/suppl/10.1177/0003122414558919/suppl_file/obrien_online_supplement.pdf) or here: https://osf.io/27e8c/. They are categorized into three groups: fourteen Science Knowledge variables, four Science Attitudes variables, four Religion Indicator variables. All variables are derived from the same data source of the same waves, therefore the

corresponding metadata is the same for all listed variables. The corresponding variable acronym used in the GSS, which is the same for every wave is indicated in brackets after the variable wording and levels. The focal manifest variable is highlighted in yellow.

Metadata on all manifest variables for the Latent Class Analysis

- Variable Data Source: General Social Survey (GSS)
- Waves / Years: 2006, 2008, 2010
- The original study is interested in the complete US population and mentions the data used are representative for the US population. Therefore, it is assumed the listed variables are used in combination with the available survey weights and appropriate survey techniques.
- In the original study, even though not indicated, they differentiate between informative and uninformative missing values. An example for informative missing values is, if an observation for example indicated “I don't know” to a knowledge question which can be recoded to a false answer. An example an uninformative missing value is, if an observation indicated “I don’t know” for an opinion question which cannot be meaningfully recoded. Therefore, when executing listwise deletion, which is indicated on page 97 in the original study, informative missing values were retained in the analysis-ready-sample while observations with at least one uninformative missing value for any of the listed variables were discarded from the analysis ready sample. Indicating which values for which variable is recoded as uninformative or informative missing is not indicated in the study however can be logically deduced. The variable list below entails only analysis-ready, meaningful levels (values).
- The sample size of the original study has 2901 observations (analysis ready observations).

Manifest Variables group 1: Science Knowledge (1 = correct answer, 0 = wrong answer):

- Center of Earth very hot? (acronym: hotcore)
- All radioactivity man-made? (acronym: radioact)
- Father’s gene decides boy or girl? (acronym: boyorgrl)
- Lasers work by focusing sound waves? (acronym: lasers)
- Electrons smaller than atoms? (acronym: electron)
- Antibiotics kill viruses as well as bacteria? (acronym: viruses)
- Sun goes around Earth or Earth around Sun? (acronym: earthsun)
- Continents been moving for millions of years and will move in future? (acronym: condrift)
- Universe began with huge explosion? (acronym: bigbang)
- Human beings developed from earlier species of animals? (acronym: evolved)
- Understand experimental research design? (acronym: expdesign)
- Does one in four chance of inherited illness mean that if the first child has the illness, the next three will not? (acronym: odds1)
- Does one in four chance of inherited illness mean that each child has the same risk of having the illness? (acronym: odds2)

- Clear understanding of what it means to study something scientifically? (acronym: scistudy)

Manifest Variables group 2: Science Attitudes

- Science and technology create more opportunities for the next generation (1=strongly disagree, 4=strongly agree) (acronym: nextgen)
- Science makes our way of life change too fast (1=strong agree, 4=strong disagree) (acronym: toofast)
- Scientific research that advances the frontiers of knowledge is necessary; should be supported by federal government (1=too little - 3 = too much) (acronym: natsci)
- Benefits of scientific research outweigh harm (0=harm strong outweighs benefits, 4=benefits strong outweigh harm)? (acronym: scibnfts)

Manifest Variables group 3: Religion Indicators

- Feelings about the bible (Word of God (1), Inspired Word (2), Book of Fables (3) (acronym: BIBLE)
- Strength of religious affiliation (1=none, 4=very strong) (acronym: reliten)

(b) Data Access

RR TEAM INSTRUCTIONS: *Describe below the data sources that will provide the replication variables. Include information such as the name of the data source (e.g., Indonesian Family Life Survey), the description and link of the data source, and the waves needed to create a final replication dataset.*

Also describe the process for accessing the data sources that will be used to create the final replication dataset; specify how long long it took for the registration to be approved and what information was required (e.g., writeup of the purpose of the project, email address from an IPCSR institution, etc.); and verify that the data can be opened as expected. If applicable, provide a link to the page where you registered to access the data.

Describe in detail any restrictions on data access and data-sharing, as well as any additional terms of data use that will be relevant for the replication study and final report (e.g. citations that will need to be made). If you were able to access the data because of special permissions that you have, but that you expect other researchers might not have, please document those as well.

The data source for replication is the same as in the original study, however different waves will be utilized. The GSS is freely available for research purposes and offers a very user-friendly platform. A free registration can be done to extract specific variables and waves in a machine-readable format (Stata and SPSS are available). This registration process including activation and approval of the account is done within minutes. Usual individual information is asked e.g. name, address, institution, which can be filled in however only a valid email address

and a password are necessary to complete registration. However, a cumulative data file with an accompanying codebook of all conducted waves can be downloaded without registration (65 mb zipped; 450 mb unzipped, https://gssdataexplorer.norc.org/pages/show?page=gss%2Fgss_data). This is also the proposed approach for the construction of the replication dataset. The data file and the codebook can be successfully opened.

A preprocessing code R-notebook is being delivered by the data finder and uploaded to OSF. This R-notebook entails all necessary code to construct the replication dataset, ready for analysis, in R. **The final preprocessed data file can be found here: https://osf.io/aqmpd/.**

Analyses done on GSS can be done freely for any kind of institution and research. For citations in academic journals the following should be used:
"Smith, Tom W., Davern, Michael, Freese, Jeremy, and Morgan, Stephen, General Social Surveys, 1972-2018 [machine-readable data file] /Principal Investigator, Smith, Tom W.; Co-Principal Investigators, Michael Davern, Jeremy Freese, and Stephen Morgan; Sponsored by National Science Foundation. --NORC ed.-- Chicago: NORC, 2018: NORC at the University of Chicago [producer and distributor]. Data accessed from the GSS Data Explorer website at gssdataexplorer.norc.org."

For other kind of citing such as in media outlets the following short description is helpful: https://gssdataexplorer.norc.org/pages/show?page=gss%2Fcite.

(c) Variable Availability

RR TEAM INSTRUCTIONS: *For each variable required for the replication analysis (listed above), describe the variables from the replication data that can be used to measure it (including which data files or sources each measure is found in),* ***any notes a data analyst should consider when using the measure in a replication analysis****, and any important differences between the original variable and the proposed replication variable.*

If there are multiple variables in the replication data that correspond to a required variable (e.g. two different measures of education in the replication data), include all of those options below. If a variable from the original study ***cannot*** *be measured using the replication data, please make that clear as well.* ***Finally, include a description of the identifiers used to merge multiple datasets, if applicable.***

Manifest Variables group 1: Science Knowledge:

- All of the listed variables are the same as above and contain the following units (values) in this group (if not indicated otherwise below the variable):
    - True (1), False (2), Don't know (8), No answer (9), Not applicable (0)

- The values indicate the answer of the respondent not the actual “true” or “false” answer to the knowledge question. Not in the original study nor in the codebook of the GSS it is indicated which of the answers is the “correct” one.
- The list of the respective variables with acronyms in brackets:
    - Center of Earth very hot? (acronym: HOTCORE)
    - All radioactivity man-made? (acronym: RADIOACT)
    - Father’s gene decides boy or girl? (acronym: BOYORGRL)
    - Lasers work by focusing sound waves? (acronym: LASERS)
    - Electrons smaller than atoms? (acronym: ELECTRON)
    - Antibiotics kill viruses as well as bacteria? (acronym: VIRUSES)
    - Sun goes around Earth or Earth around Sun? (acronym: EARTHSUN)
    - Continents been moving for millions of years and will move in future? (acronym: CONDRIFT)
    - Universe began with huge explosion? (acronym: BIGBANG)
    - Human beings developed from earlier species of animals? (acronym: EVOLVED)
    - Understand experimental research design? “Better way to test drug btw control and non-control” (acronym: EXPDESGN) (All 1000 get the drug (1), 500 get the drug 500 don’t (2), Don’t know (8), No answer (9), Not applicable (0))
    - Does one in four chance of inherited illness mean that if the first child has the illness, the next three will not? (acronym: ODDS1) (Yes (1), No(2), Don’t know (8), No answer (9), Not applicable (0))
    - Does one in four chance of inherited illness mean that each child has the same risk of having the illness? (acronym: ODDS2) (Yes (1), No (2), Don’t know (8), No answer (9), Not applicable (0))
    - Clear understanding of what it means to study something scientifically? (acronym: SCISTUDY) (Clear Understanding (1) - Little Understanding (3), Don’t know (8), No answer (9), Not applicable (0))

Manifest Variables group 2: Science Attitudes

- All of the listed variables are the same as above and contain the following units (values) in this group (if different units/scale is used it is indicated behind the acronym):
    - Strongly Disagree (1) - strongly agree (4), Don’t know (8), No answer (9), Not applicable (0)
- The list of the respective variables with acronyms in brackets:
    - Science and technology create more opportunities for the next generation (acronym: NEXTGEN)
    - Science makes our way of life change too fast (acronym: TOOFAST)
    - Scientific research that advances the frontiers of knowledge is necessary; should be supported by federal government (acronym: NATSCI) (Too little (1) - Too much (3), Don’t know (8), No answer (9), Not applicable (0)
    - Benefits of scientific research outweigh harm? (acronym: SCIBNFTS) (Benefits greater (1) - Harmful results greater (3), Don’t know (8), No answer (9), Not applicable (0)

Manifest Variables group 3: Religion Indicators

- All of the listed variables are the same as above.
- The list of the respective variables with acronyms in brackets:
    - Feelings about the bible (acronym: BIBLE) (Word of God (1), Inspired Word (2), Book of Fables (3), Other (4), Don't know (8), No answer (9), Not applicable (0)
    - Strength of religious affiliation (acronym: RELITEN) (Strong (1) - no religion (4), Don't know (8), No answer (9), Not applicable (0))

It should be noted again that there is no deviation in any kind between the operationalization of the variable constructs of the original study and the one of the proposed replication as all variables (constructs) are derived from the same survey. The only deviation possible is the operationalization of informative and uninformative missings as this is not explicitly stated in the original study, however the estimated impact of this is rated extremely low (by the data finder) as only a handful of observations chose these categories (values).

(d) Data Creation

RR TEAM INSTRUCTIONS: *Create a dataset using the data sources and variables listed above. Provide a detailed narrative describing how the various datasets were cleaned and merged into a final replication dataset. Provide a view-only link to a clearly commented script on the OSF that produces the replication data as described in the narrative. Our preference is that this be either an R script or a script from another language that similarly allows for open and reproducible analyses. Please let the SCORE team know if this is not possible.*

- *If the data can be freely shared and posted to OSF, please post it in your OSF project and provide a link to the completed dataset below.*
- *If any part of the dataset cannot be shared between researchers or posted to the OSF, please leave the final dataset off the OSF. Instead, include either below or in your script (commented out at the bottom) two pieces of information that will help an independent team verify they have created the dataset according to your instructions:*
    - *The dimensions of the final dataset(s) you've created (# of rows, # of columns)*
    - *A summary of 8-10 variables in the replication dataset. For numeric variables, the summary should include the mean, standard deviation, and count of NAs. For categorical variables, the summary should include each level present in the data and its count, as well as a count of NAs. If multiple datasets are submitted as part of your work, at least one variable should be included from each dataset.*

The data from the replication sources should be preserved in as 'raw' a form as possible, in order to give the data analyst the most latitude to clean the variables as they see fit. Variables from the original source should be preserved in their original form (e.g. do not recode values of 99 to NA). New variables should only be created when they're needed to complete the merge or

combine the datasets; in those cases, please preserve a version of the original, unaltered variable in the new dataset.

When combining multiple datasets by binding rows, please be sure that the data type and measurement units are equivalent across each dataset. If there is a discrepancy in how a variable is measured across datasets, rename the variable in each dataset to indicate the original dataset, and then carefully document the resulting measures below and in the data dictionary. See here for an example of how this should work.

Please also use this section to describe:

- *Any deviations between the original study design and the replication design that would result from using this replication dataset.*
- *Any notes about using these variables that you would like to pass along to the data analyst.*

The attached html R-notebook script is very detailed in its sections and can be found here: https://osf.io/wg8td/. The uncompiled script version can be found here: https://osf.io/rzyx9/. The most important thing the data analyst needs to understand is the use of informative and uninformative missings (indicated in section 12b) and the existence of knowledge questions which were answered by the respondents however no “correct” answer is provided by the GSS. The latter is important to know as the informative missing values of, specific for each variable, need to be recoded to the officially “wrong” category in order to preserve as many observations as possible. This is at least the authors’ way of doing of the original study.

In the code file helper objects were built that indicate a sophisticated guess by the data finder, which values for which variable can be indicated as an informative missing value and therefore observations with these values should be preserved.

(e) Data Dictionary

RR TEAM INSTRUCTIONS: *Create a data dictionary following this template. Provide below a view-only link to the completed data dictionary included in the OSF project. If the Data Analyst will need to create new variables using the variables in the final replication dataset (e.g. recoding the provided education variable to be in a better format for analysis), please document below your recommendation on how the analyst should do so. Please also document any additional notes regarding the variables in the dataset that do not fit within the provided data dictionary template or the other sections above.*

The data dictionary can be found here: https://osf.io/xknmw/.

The complete codebook of the GSS is uploaded here: https://osf.io/px65a/.

The data file can be found here: https://osf.io/aqmpd/

The R code for creating the dataset can be found here: https://osf.io/rzyx9/

13. Sample size

RR TEAM INSTRUCTIONS: *Please report below the analytic sample size(s) in the replication dataset, with reference to however many units or levels are in the data. Please report as much information here as will be helpful for the review committee to be aware of, including differences in sample size resulting from various analytic decisions (e.g. listwise deletion vs multiple imputation).* ***Finally, when the replication combines observations from the original study with new observations, please estimate what proportion of the analytic sample's observations will be comprised of original vs. new observations.***

Data finders' response goes here:
The proposed replication dataset includes four descending waves of the same data source, the GSS. Therefore the sample parameters are the same and can be perfectly replicated. The replication dataset of the proposed waves (2012, 2014, 2016, 2018) would entail 2164 observations when doing listwise deletion (depending on the operationalization and inclusion of uninformative and informative missings, as approximately done as in the original study). The original study presents 2901 valid observations. In my opinion multiple imputation is not helpful here, as the questions are multifaceted and there is not always enough information available.

Required sample size [to be filled out by the SCORE team]: The primary unit of analysis is the individual. An estimate of the minimum viable sample size for the data analytic replication is: 33. For comparison, the stage1 required sample size would be: 153 and the stage2 sample size would be: 339.

Notes: Right now, the power analysis assumes that the proportion of the sample that falls into the traditional and postsecular groups will be the same in the replication as in the original (~66% vs. ~33%). The analysis assumes that the LCA that is used to produce the groups that are then used in the t-test will find the same obvious groups in the new data.

14. Sample size rationale

For data analytic replications in SCORE, three sample sizes are calculated:

- *A minimum threshold sample size, defined as the sample size required for 50% power of 100% of the original effect*

- *A stage 1 sample size, defined as the sample size needed to have 90% power to detect 75% of the original effect*
- *A stage 2 sample size, defined as the sample size needed to have 90% power to detect 50% of the original effect*

Details about how those sample sizes were calculated for this project are found here.

15. Stopping rule (provided by SCORE)

RR TEAM INSTRUCTIONS:

Since the replication dataset combines observations from the original study with a more recent set of observations, SCORE recommends that three analyses be performed:

- One analysis that only uses observations that were ***not*** used in the original study.
- One analysis that combines all available observations.
- One analysis that only uses observations that ***were*** used in the original study.

Variables

RR TEAM INSTRUCTIONS: *The preregistration form divides variables across three questions: manipulated variables, measured variables, and indices (i.e. analytic variables derived from raw variables). For existing data replications, only fill out the "Measured variables' and 'Indices' sections. Please do not fill out anything in the 'Manipulated variables' section.*

The raw data of any transformed variable (e.g. reaction time → log reaction time) or any created index should be defined in the 'Measured variables' section. Details regarding the variable transformation should be specified in the 'Transformations' section. Details regarding the creation of an index should be specified in the 'Indices' section.

Across these questions, you should define all variables that will later be used during your analysis (including data preparation/processing). You can describe all variables in the preregistration and/or summarize and link to a data dictionary (codebook) in your repository to answer these questions.

If you will share data from your replication, this is also the place to state whether any variables will be removed prior to sharing the dataset (e.g. to reduce risk of participant identification or comply with copyright restrictions on scale items.)

16. Manipulated variables

RR TEAM INSTRUCTIONS: *Manipulated variables in this preregistration refer specifically to variables that have been randomly assigned in an experiment. The use of data from an experiment should be rare in existing data replications. If your existing data replication relies on*

experimental data, please document each manipulated variable as a measured variable, and use the codebook to indicate what each level of the variable corresponds to (e.g. participants assigned to the treatment condition = 1; participants assigned to the control condition = 0). The default language in bold below has been copied into all existing data replication preregistrations.

N/A -- not documented for existing data replications.

17. Measured variables

RR TEAM INSTRUCTIONS: *Please use this section to document each variable that was used in the original study's analysis and the role it served (e.g. dependent variable, control variable, sample parameter, etc). For each variable, provide the description of the variable offered in the paper and/or codebook of the original study, the variable in the replication dataset that it corresponds to, and explain any deviations between the two. In cases where an equivalent replication variable was not found, explain how, if at all, you expect it will affect the replication attempt. In cases where you are adding a variable that was not present in the original study, please explicitly state that you are doing so, and explain how, if at all, you expect it will affect the replication attempt.*

Specific points to keep in mind (please also consult the Reviewer Criteria):

- *Does the preregistration surface all of the variables needed to replicate the focal analysis?*
- *Are deviations between the original variables and replication variables documented when needed?*

A link to an updated data dictionary can be found here: https://osf.io/v2yb5/

The study required two steps: conducting the latent class analysis and testing whether the classes differ on the variable "evolved."

For the latent class analysis, I manipulated three groups of variables:

For the first group of variables, 'don't know' is treated as an informative missing and left in the analysis. 'No answer' and 'not applicable' are treated as missing.

Hotcore, radioact, boyorgrl, lasers, electron, viruses, earthsun, condrift, bigbang, evolved, expdesgn, odds1, odds2, scistudy

For the second group of variables, ‘don’t know,’ ‘no answer,’ and ‘not applicable’ were all treated as missing. Toofast was also reverse coded.

The recoded values are as follows:

Nexgen, and advfront – 1 = Strongly agree, 2= agree, 3= disagree 4=strongly disagree

Scibnfts – 0 = hamfuls results greater than benefits, 2 = about equal, 4 = benefits greater than harm

Toofast – 1 = strongly disagree, 2 = disagree, 3= agree, 4= strongly agree

For the third group of variables, I recoded the variable ‘bible.’ The variable correspond directly to the responses to the original variable. All respondents who did not choose one of the three possible responses (word of God, inspired by the word of God, fables) were coded as missing.

Bible – 1 = Word of God, 2= Inspired by the word of God, 3 = fables, legends, and moral precepts

Reliten – 4 = strong, 3=not very strong, 2 = somewhat strong, 1 = no religion

For the t-test, I created a set of variables reflecting the class that respondents are assigned to.

Variables created from the latent class model include: traditional, modern, and post-secular. To decide which class is which, I check the means of the manifest variables (variables included in the Latent Class Model) and label them with the following principles:

1. The modern category will have the weakest religious beliefs and high scores for science literacy and attitude questions.

2. The traditionalist category will have strong religious beliefs and low scores for all science literacy and attitude questions.

3. The post-secular category will have strong religious beliefs and high scores for many science and literacy questions, but not all.

I draw these descriptions from the original text, page 103.

VARIABLE NAME

- [Use in the analysis]
- [Description from the original study]
- [Variables used in the replication (if it needs to be constructed from multiple measures, include all of them here)]
- [Deviations between the original study and the replication study]

NEXTGEN

- Manifest variable
- Perspectives on science encompass attitudes about science as well as knowledge of scientific concepts and methods. We examine attitudes about science using survey questions commonly used to measure public appreciation of science (Miller 2004).
- NEXTGEN (same variable, newer waves of the data)
- No deviations.

TOOFAST

- Manifest variable
- Perspectives on science encompass attitudes about science as well as knowledge of scientific concepts and methods. We examine attitudes about science using survey questions commonly used to measure public appreciation of science (Miller 2004).
- TOOFAST (same variable, newer waves of the data)
- No deviations.

ADVFRONT

- Manifest variable
- Perspectives on science encompass attitudes about science as well as knowledge of scientific concepts and methods. We examine attitudes about science using survey questions commonly used to measure public appreciation of science (Miller 2004).
- ADVFRONT (same variable, newer waves of the data)
- (This differs from the data prepared by Marco Ramljak. Based on the questions from table two of the original paper, I believe this is the question used in the original analysis, rather than NATSCI.)

SCIBNFTS

- Manifest variable
- Perspectives on science encompass attitudes about science as well as knowledge of scientific concepts and methods. We examine attitudes about science using survey questions commonly used to measure public appreciation of science (Miller 2004).
- SCIBNFTS (same variable, newer waves of the data)
- No deviations.

HOTCORE

- Manifest variable

- Description from O'Brien and Noy 2015: We examine knowledge of science using a series of 14 quiz-style questions modeled as binary variables.
- HOTCORE (same variable, newer waves of the data)
- No deviations

RADIOACT
- Manifest variable
- Description from O'Brien and Noy 2015: We examine knowledge of science using a series of 14 quiz-style questions modeled as binary variables.
- RADIOACT (same variable, newer waves of the data)
- No deviations

BOYORGRL
- Manifest variable
- Description from O'Brien and Noy 2015: We examine knowledge of science using a series of 14 quiz-style questions modeled as binary variables.
- BOYORGRL (same variable, newer waves of the data)
- No deviations

LASERS
- Manifest variable
- Description from O'Brien and Noy 2015: We examine knowledge of science using a series of 14 quiz-style questions modeled as binary variables.
- LASERS (same variable, newer waves of the data)
- No deviations

ELECTRON
- Manifest variable
- Description from O'Brien and Noy 2015: We examine knowledge of science using a series of 14 quiz-style questions modeled as binary variables.
- ELECTRON (same variable, newer waves of the data)
- No deviations

VIRUSES
- Manifest variable
- Description from O'Brien and Noy 2015: We examine knowledge of science using a series of 14 quiz-style questions modeled as binary variables.
- VIRUSES (same variable, newer waves of the data)
- No deviations

EARTHSUN
- Manifest variable
- Description from O'Brien and Noy 2015: We examine knowledge of science using a series of 14 quiz-style questions modeled as binary variables.
- EARTHSUN (same variable, newer waves of the data)

- No deviations

CONDRIFT
- Manifest variable
- Description from O'Brien and Noy 2015: We examine knowledge of science using a series of 14 quiz-style questions modeled as binary variables.
- CONDRIFT (same variable, newer waves of the data)
- No deviations

BIGBANG
- Manifest variable
- Description from O'Brien and Noy 2015: We examine knowledge of science using a series of 14 quiz-style questions modeled as binary variables.
- BIGBANG (same variable, newer waves of the data)
- No deviations

EVOLVED
- Manifest variable and **outcome of the t-test** (the requested hypothesis).
- Description from O'Brien and Noy 2015: We examine knowledge of science using a series of 14 quiz-style questions modeled as binary variables.
- EVOLVED (same variable, newer waves of the data)
- No deviations

EXPDESGN
- Manifest variable
- Description from O'Brien and Noy 2015: We examine knowledge of science using a series of 14 quiz-style questions modeled as binary variables.
- EXPDESGN (same variable, newer waves of the data)
- No deviations

ODDS1
- Manifest variable
- Description from O'Brien and Noy 2015: We examine knowledge of science using a series of 14 quiz-style questions modeled as binary variables.
- ODDS1 (same variable, newer waves of the data)
- No deviations

ODDS2
- Manifest variable
- Description from O'Brien and Noy 2015: We examine knowledge of science using a series of 14 quiz-style questions modeled as binary variables.
- ODDS2 (same variable, newer waves of the data)
- No deviations

SCISTUDY

- Manifest variable
- Description from O'Brien and Noy 2015: We examine knowledge of science using a series of 14 quiz-style questions modeled as binary variables.
- SCISTUDY (same variable, newer waves of the data)
- No deviations

RELITEN

- Manifest variable
- Description from O'Brien and Noy 2015: We also analyze individuals' religiosity as an ordinal variable based on a question that asked respondents to rate the strength of their religious beliefs on a fourpoint scale, where higher scores correspond to stronger belief.
- RELITEN
- No deviations

BIBLE

- Manifest variable
- Description from O'Brien and Noy 2015: To measure perspectives on religion, we analyze responses to a question that asked whether the Bible is (1) the actual word of God, (2) inspired by the word of God, or (3) filled with myths and fables. This item, which we model as a nominal variable, is frequently used to measure views of certain religious interpretations of the world (Davis and Robinson 1999).
- BIBLE (same variable, newer waves of the data)
- No deviations

Predclass

- Outcome of Latent Class Model
- This variable is created by using the predicted probability that a respondent will fall into a latent class. Labels for the classes are generated using the principles listed in section 16.
- Variable not included in the original dataset.
- There are no significant deviations between this variable and the coding of the original study.

PostsecVsTrad

- Recode of predclass
- For this variable, post-secularists are coded as '1' and traditionalists are coded as '0'. I create this variable to conduct a t-test for the two groups.
- Variable not included in the original dataset.

18. Indices

RR TEAM INSTRUCTIONS: *If any of the measured variables described in Section 17 will be combined into a composite measure (including simply a mean), describe in detail what*

measures you will use and how they will be combined. Please be sure this preregistration includes a link to a clearly commented script that constructs the index according to the narrative.

Specific points to keep in mind (please also consult the Reviewer Criteria):

- *Does the preregistration specify each of the composite measures (e.g. mean scores, factor scores) that are needed for the focal analysis, and which of the measured variables in Section 17 are used in each one (e.g. the happiness, joy, and satisfaction items will be used to create the 'positive feelings' measure)?*
- *Does the preregistration link to a clearly commented script that constructs the indices according to the narrative description?*

Three measures are created from the results of the Latent Class Analysis: traditional, modern, and post-secular. Respondents are categorized into one of these three options if the probability of them falling into that category (generated from the Latent Class Analysis) is greater than the other two categories. LCA only provides the probability of falling into a class; it does not label the categories. To decipher the labels for the categories, I look at the conditional means from the LCA and match them according to the principles from O'Brien and Noy 2015. See section 16 of this pre-registration for the conditions used to label the categories.

Analysis Plan

19. Statistical models

RR TEAM INSTRUCTIONS: *This section should describe in detail the analysis that will be performed to replicate the focal result. This analysis must align as closely as possible with the original study's analysis, even if you have identified limitations in the original study. The level of detail should allow anyone to reproduce your analyses from your description below. Examples of what should be specified: the model; each variable; adjustments made to the standard errors and to case weighting; additional analyses that are required to set up the focal analysis; and the software used.*

Beyond the replication of the focal analysis from the original study, it is at your discretion to test the claim using other analytic approaches as a check of the robustness of the claim. The original test should be listed first and be clearly distinguished from any other tests. If you are testing additional confirmatory hypotheses, describe them in the same order as you numbered them in the "Hypotheses" section above and make clear reference to the specific hypothesis being tested for each.

Please provide a link to a clearly commented script that performs the analysis described in the narrative provided below. Our preference is that this be either an R script or a script from another language that similarly allows for open and reproducible analyses. Please let the SCORE team know if this is not possible. Please also test that the code runs without error on a random subset of 5% of the replication dataset, and provide verification that the code has produced a sensible result below (a screenshot of the results is preferable). Finally, please confirm that you have only developed and tested your analysis plan and code using 5% of the data.

Specific points to keep in mind (please also consult the Reviewer Criteria):

- *Does the preregistration specify which statistical model will be used to provide the 'focal evidence' for the SCORE test (e.g. a regression coefficient in a larger multiple regression model), and does it correspond closely to the model and evidence from the original study?*
- *Does the preregistration describe each variable that will be included in the focal analysis, and what role each variable has (e.g. dependent variable, independent variable)?*
- *Does the preregistration include a detailed specification of the focal analysis, including interactions, lagged terms, controls, etc., in both narrative form and in a clearly commented script?*
- *Does the preregistration verify that the code runs without error on a random subset of the replication dataset?*

This statement confirms that only 5% of the data have been randomly sampled in developing the analysis plan and code contained in this preregistration.

H*: Members of the post-secular category were significantly less likely than members of the traditional group to respond that humans evolved from other animals (3 percent, significant at $p < 0.05$ on a two-tailed test, see Table 2, rightmost column).

I do not conduct all analyses in the original paper. Instead, I conduct Latent Class Analysis and run a t-test comparing the responses to EVOLVED by post-secularists and traditionalists.

To test this, I first conduct Latent Class Analysis using the responses from 20 survey questions. I conduct this analysis using Stata 16's 'lclass' option in 'gsem'. See the uploaded do-file for the complete analysis code (https://osf.io/q7muh/). The variables I include are listed in section 17 of this preregistration. Recodes are described in section 20 of this preregistration. How missing data are handled is described in section 23 of this preregistration.

Following listwise deletion and deleting years per the relevant analysis, I create a 5% subsample of the dataset for these analyses.

I run the Latent Class Models. I assign ‘bible’ as a multinomial logistic predictor, I assign ‘scistudy,’ ‘nextgen,’ ‘toofast,’ ‘advfront,’ ‘scibnfts,’ ‘scistudy,’ and ‘reliten’ as ordinal logistic predictors, and I assign all other manifest variables (see section 17) as binomial logistic predictors. I randomly draw 15 start values to determine where the model should begin testing the sample space. I create three categorical classes. No adjustments are made to the standard errors. I weight the results using sample weights (wtss).

After the model runs, I predict the probability that each respondent will fall into particular classes. I create a new variable (predclass) with three categories and assign respondents to a category depending on which class has the highest probability.

I check the mean responses for each of the manifest variables by the variable ‘predclass’. From an ocular examination, and using the principles listed in section 17, I assign labels to ‘predclass’ (Modern, Post-secular, or Traditional).

I create a new variable (PostsecVsTrad) which is coded as 1 if respondents are in the post-secular category and 0 if respondents are in the traditional category.

Finally, I conduct a t-test on responses to the evolution question (Human beings developed from earlier species of animals?) by traditionalist and post-secularists.

20. Transformations

RR TEAM INSTRUCTIONS: *This section should describe how any of the measured variables or composite measures mentioned above will be transformed prior to the analyses listed in Section 19. These are adjustments made to variables **after** measurement or measure creation, and might include centering, logging, lagging, rescaling etc. Please provide enough detail such that anyone else could reproduce the transformations based on the description below. Please be sure this preregistration includes a link to a clearly commented script that performs the transformations described in the narrative provided below.*

Specific points to keep in mind (please also consult the Reviewer Criteria):

- *Does the preregistration specify which of the measured variables or composite measures will need to be transformed prior to the focal analysis?*
- *For each variable needing transformation, does the preregistration adequately describe the transformations, including any centering, logging, lagging, recoding, or implementation of a coding scheme for categorical variables?*
- *Does the preregistration link to a clearly commented script that performs each transformation?*

The do-file which contains the recode can be found here: (https://osf.io/q7muh/).

For the following variables, I recode correct responses as '1', incorrect responses as zero '0', and don't know as '0'. Other responses are recoded as missing. Those variables include: hotcore, radioact, boyorgrl, lasers, electron viruses earthsun condrift bigbang evolved expdesgn odds1 odds2.

I code scientific study (scistudy) with its original three possible responses. Don't know (8), No answer (9), and not applicable (0) are coded as missing.

Scale response variables (nextgen, toofast, advfront, scibnfts) are recoded to account for missing. Don't know (8), no answer (9), and not applicable (0) are recoded as missing. TOOFAST must also be reverse coded.

Bible is recoded using its original three responses (word of God, inspired by the word of God, and fables), while don't know (8), no answer (9), and not applicable (0) are coded as missing.

Religious affiliation (religen) is recoded such that don't know (8), no answer (9), and not applicable (0) are coded as missing.

21. Inference criteria

RR TEAM INSTRUCTIONS: *This section describes the precise criteria that will be used to assess whether the hypotheses listed above were confirmed by the analyses in Section 19. The default language below only applies to the test of the SCORE claim, **H***. It is at your discretion to describe the inferential criteria you will use for any additional analyses. They need not rely on p-values and/or the same alpha level we have specified for **H***.*

If the additional analyses will use multiple comparisons, the inference criteria is a question with few "wrong" answers. In other words, transparency is more important than any specific method of controlling the false discovery rate or false error rate. One may state an intention to report all tests conducted or one may conduct a specific correction procedure; either strategy is acceptable.

Criteria for a successful replication attempt for the SCORE project is a statistically significant effect (alpha = .05, one tailed) in the same pattern as the original study on the focal hypothesis test (**H***). For this study, this criteria is met by a one-tailed t-test showing that, compared to traditionalists, post-secularists are significantly less likely to correctly state that humans evolved from earlier species of animals.

For this study, the request from OSF asks if post-secularists were significantly less than traditionalists, implying a one-tailed test. The original paper uses a two-tailed t-test for significant differences between the categories ($p<.05$). I will include results to both analyses, although I follow SCORE's replication criterion and define a successful replication as a significant one-tailed test ($p<.05$).

In the following results, "group 1" is post-secularists.

Results from a 5% sample of years 2012, 2014, 2016, and 2018

```
. // Result of interest:
. ttest evolved_clean, by(PostsecVsTrad)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	40	.95	.0348991	.2207214	.8794099	1.02059
1	49	.1428571	.0505076	.3535534	.0413048	.2444095
combined	89	.505618	.0532968	.5028011	.3997018	.6115342
diff		.8071429	.0642127		.6795132	.9347725

```
    diff = mean(0) - mean(1)                                  t =  12.5698
Ho: diff = 0                     degrees of freedom =       87

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 1.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 0.0000
```

Results from a 5% sample of all years:

```
. // Result of interest:
. ttest evolved_clean, by(PostsecVsTrad)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	126	.3253968	.041906	.4703933	.2424597	.4083339
1	39	0	0	0	0	0
combined	165	.2484848	.033744	.4334499	.1818561	.3151136
diff		.3253968	.0754826		.1763471	.4744466

```
    diff = mean(0) - mean(1)                                      t =   4.3109
Ho: diff = 0                     degrees of freedom =      163

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 1.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 0.0000
```

Results from a 5% sample of the years included in the original paper (2006, 2008, and 2010)

```
. // Result of interest:
. ttest evolved_clean, by(PostsecVsTrad)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	83	.2409639	.0472281	.4302683	.1470122	.3349155
1	22	.0909091	.0627332	.2942449	-.0395518	.22137
combined	105	.2095238	.0399066	.4089207	.1303876	.28866
diff		.1500548	.0974173		-.0431495	.343259

```
    diff = mean(0) - mean(1)                                      t =   1.5403
Ho: diff = 0                     degrees of freedom =      103

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9367         Pr(|T| > |t|) = 0.1265          Pr(T > t) = 0.0633
```

22. Data exclusion

RR TEAM INSTRUCTIONS: *The section below should describe the rules you will follow to exclude collected cases from the analyses described in Section 19. Note that this refers to exclusions **after** the creation of the replication dataset; exclusion criteria that prevent a case from entering the replication dataset in the first place should be detailed in the 'Data Collection Procedure' section above. Please be as detailed as possible in describing the rules you will follow (e.g. What is the specific definition of outliers you will use? Exactly how many attention checks does a participant need to fail before their removal from the analytic sample?).*

Specific points to keep in mind (please also consult the Reviewer Criteria):

- *Does the preregistration comment on whether any cases included in the replication dataset will be excluded prior to data analysis?*
- *If yes, does the preregistration provided detailed instructions on how the exclusions will be performed (e.g. Is the definition of outlier provided? Is the number of attention checks failed before a participant is excluded specified?)*

n/a

23. Missing data

RR TEAM INSTRUCTIONS: *The section below should describe how missing or incomplete data will be handled. Please be as detailed as possible in describing the exact procedures you will follow (e.g. last value carried forward; mean imputation) and any software required (e.g. We will use Amelia II in R to perform the imputation).*

Specific points to keep in mind (please also consult the Reviewer Criteria):

- *Does the preregistration comment on how missing or incomplete data will be addressed (e.g. casewise removal, missing data imputation)?*
- *If applicable, does the preregistration specify how many missing variables will lead to a case's removal (e.g. If a subject does not complete any of the three indices of tastiness, that subject will not be included in the analysis.)?*
- *If applicable, does the preregistration describe how missing data imputation will be performed, including relevant software?*

In this analysis, I conducted three analyses: the first only included observations from GSS survey years 2012, 2014, 2016, and 2018; the second included all observations; the third included the years from the original paper (2006, 2008, and 2010). Variables with missing data are removed from the analytic sample using listwise deletion. One missing response to any question justifies removal. A do-file detailing how missing values were removed can be found here: (https://osf.io/q7muh/).

The original paper also uses listwise deletion. I do not perform imputation, similar to the original study. I test my coding scheme against the original paper's by checking the number of observations for each year for the years used in the original paper. The sample sizes from the original study were: 1,563 from 2006; 988 from 2008; and 350 from 2010. The sample sizes from my coding scheme were: 1,608 from 2006, 1,016 from 2008, and 367 from 2010. My analytic sample has 90 extra observations. I do not believe this difference will impact the focal hypothesis test.

24. Exploratory analysis (Optional)

RR TEAM INSTRUCTIONS: *If you plan to explore your data set to look for unexpected differences or relationships, you may describe those tests here. An exploratory test is any test where a prediction is not made up front, or there are multiple possible tests that you are going to use. A statistically significant finding in an exploratory test is a great way to form a new confirmatory hypothesis, which could be registered at a later time. If any exploratory analyses involve additions to the data collection procedure beyond what was performed in the original study (e.g. additional items on the survey; running another condition in the experiment), please describe them below.*

n/a

No exploratory analyses were or will be conducted.

25. Other

RR TEAM INSTRUCTIONS: *This section serves two purposes. First, please use this section to discuss any features of your replication plan that are not discussed elsewhere. Literature cited, disclosures of any related work such as replications or work that uses the same data, plans to make your data and materials public, or other context that will be helpful for future readers would be appropriate here. Second, please also re-surface any major deviations from earlier in the preregistration that you expect a reasonable reviewer could flag for concern. Give a summary of these deviations, focusing on larger changes and any possible challenges for comparing the results of the original and replication study.*

Specific points to keep in mind (please also consult the Reviewer Criteria):

- *Does the preregistration reference other sections of the preregistration where substantial deviations from the original study have been described (including deviations due to differences in location or time compared to the original study)?*
- *Does the preregistration comment on plans to make the data and materials from the replication study public?*

I tested the analytic sample my code produces using the same years as the original study. I found that my sample contains 90 more respondents than the original study. It's unclear how the original authors decided to remove those observations. I do not believe this difference changes the outcome of the focal hypothesis test.

I currently have no plans to make the data and materials from this replication study public, outside of the general policies of OSF.

Final review checklist

REVIEWER INSTRUCTIONS: *For the following questions, reviewers please indicate whether you can 'sign off' on the following items by adding a comment. You can update this response as the lab moves through revisions during the review period!*

- Included in this pre-registration are specific materials needed to create a replication dataset:
    - Is the final replication dataset that the research team constructed suitable for performing a high-quality, good-faith replication of the focal claim selected from the original study?
    - Is the procedure for constructing the final replication dataset sufficiently documented that an independent researcher could construct the same dataset following the procedures and code they lay out?
- Included with this pre-registration is a narrative description of how the replication dataset will be used to perform the focal replication analysis, as well as the specific analytic scripts/code/syntax that will be used:
    - Is the analysis plan (including code) that's documented in the preregistration consistent with a high-quality, good-faith replication of the focal claim selected from the original study?
    - Has the data analyst demonstrated that the analysis code works as expected on a random 5% of the final replication dataset?
- I have reviewed all sections of this pre-registration, and I believe it represents a good-faith replication attempt of the original focal claim.