TREND: WRITING REPORTS FOR QUASI-EXPERIMENTS

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Introduction

The TREND statement—an acronym that represents the Transparent Reporting of Evaluations with Non-randomized Designs—is a checklist writers should utilize when they report a quasi-experiment. To clarify, researchers often compare two or more conditions, such as two teaching methods. In many of these studies, the participants or units are not randomly assigned to these conditions. This design is called a quasi-experiment or non-randomized design. TREND is a set of principles that researchers should observe whenever they report quasi-experiments or non-randomized designs.

**Illustration**

Suppose a researcher wants to explore whether lecturers who wear casual attire enhances student engagement more than do lectures who wear formal attire. In this study, students are not randomly allocated to these lecturers. Instead, whether they observe lecturers in casual attire or formal attire depends on whether they attended Tuesday classes or Wednesday classes.

**Purpose of this document**

This document lists every TREND principle and then includes examples to illustrate each principle. These principles do not encompass every paragraph you should include. Instead, these principles stipulate the most important details you should include.

**TREND checklist**

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| Title and abstract | | |
| Item | Description of the item—as specified by Des Jarlais et al (2004) | Example |
| 1 Title and abstract | Information on how unit were allocated to interventions | * Participants who were assigned to the Tuesday classes observed the lecturer wearing casual attire; participants who were assigned to the Wednesday class observed the lecturer wearing formal attire… |
|  | Structured abstract recommended | NB. Some journals prefer writers subdivide the abstract into distinct sections such as   * Background * Method * Findings * Implications |
|  | Information on target population or study sample | * The participants were psychology students at Charles Darwin University, aged between 18 and 65. |

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| Introduction | | |
| Item | Description of the item | Example |
| 2 Background | Scientific background and explanation of rationale | * According to the deviant hypothesis, when individuals are exposed to cues that typify convention, such as formal attire, they tend to behave more conventionally. Their creativity diminishes. * Because creativity has been shown to promote positive emotions, this decrease in creativity is likely to limit student engagement. |
|  | Theories used in designing behavioural interventions | * Not applicable to this study |

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| Method | | |
| Item | Description of the item | Example |
| 3 Participants | Eligibility criteria for participants, including criteria at different levels in recruitment/sampling plan (e.g., cities, clinics, subjects) | * All students enrolled in a specific first year psychology unit were invited to participate. |
|  | Method of recruitment (e.g., referral, self-selection), including the sampling method if a systematic sampling plan was implemented | * The students received an email from the researcher immediate after the first class. This email asked students whether they would like to complete a survey about the first class. |
|  | Recruitment setting | * “ |
|  | Settings and locations where the data were collected | * Students received online surveys during the first week and last week of the semester, immediately after the class. The students were prompted to complete these surveys within 5 days of receiving the survey at a time and location of their choice. They were encouraged to complete the surveys in a location in which they will not be disturbed. |
| 4 Interventions | Details of the interventions intended for each study condition and how and when they were actually administered, specifically including |  |
|  | Content: what was presented?  Delivery method: how was the content presented?  Unit of delivery: how were the subjects grouped during delivery  Setting: where was the intervention delivered  Deliverer: who delivered the intervention? | * The students attended 12 lectures on psychology, each lasting approximately 2 hours, on either a Tuesday or Wednesday at 10.00 in the morning. The same individual presented all lectures, but wore casual attire on the Tuesdays and formal attire on the Wednesdays * In each condition, all the students attended the same lectures * The lectures were presented in an auditorium that seats 100 individuals, although only about 50 students, on average, representing 80% of the cohort, attended each lecture * These lectures were presented at Charles Darwin University, Casuarina campus, by a male senior lecturer who was 45 years of age. |
|  | Exposure quantity and duration: how many sessions or episodes or events were intended to be delivered? How long were they intended to last?  Time span to deliver the intervention to each unit? | * On average, the students who were assigned to the Tuesday classes attended 10.4 of the 12 lectures (sd = 1.42). The students who were assigned to the Wednesday classes attended 10.2 of the 12 lectures (sd = 1.39). An independent t-test uncovered no significant difference in attendance rate, t(98) = .947, p > .05 |
|  | Activities to increase compliance or adherence (e.g., incentives) | * Whether or not students attended was recorded at the start and end of each lecture. Furthermore, to promote attendance, students received five clues to the forthcoming exam during each class. * Students also received a text reminder before each class. |
| 5 Objectives | Specific objectives and hypotheses | * The aim of this study was to explore whether clothing can affect student engagement. The hypothesis was that casual attire should enhance student engagement more than formal attire—but this effect might diminish over time as individuals become habituated to the clothes of this lecturer |
| 6 Outcomes | Clearly defined primary and secondary outcome measures | * To measure student engagement, participants completed the student engagement scale—a scale that comprises 15 items, such as “I felt absorbed during the class”. * In addition, students were asked to indicate which of several words the lecturer uttered during the previous lecture—an objective measure of concentration and thus engagement. |
|  | Methods used to collect data and any methods used to enhance the quality of measurements | * One complication is that disengaged students might not answer the questions as accurately. To assess this possibility, participants also completed the inattentive scale—a measure that gauges the extent to which individuals are concentrating while completing the questionnaire. |
|  | Information on validated instruments such as psychometric and biometric properties | * In past research, Cronbach’s  for the student engagement scale approximates 0.85 (Smith, 2005), implying high levels of internal consistency (Nunnaly, 1975). Furthermore, as evidence of validity, research indicates that student engagement, as measured by this scale, strongly predicts subsequent exam performance even after controlling previous grades (Brown, 2010). |
| 7. Sample size | How sample size was determined and, when applicable, explanation of any interim analyses and stopping rules | * An a priori power analysis was conducted using GPower. This analysis indicated that 100 participants would generate a power of 0.8, assuming a medium effect size. Hence, the sample size of 100 was deemed as suitable for these circumstances. |
| 8 Assignment method | Unit of assignment (the unit being assigned to study condition, e.g., individual, group, community) | * Each individual was assigned to one of the two conditions. |
|  | Method used to assign units to study conditions, including details of any restriction (e.g., blocking, stratification, minimization) | * At the start of this semester, students received a timetable, indicating whether they should attend Tuesdays or Wednesdays. An algorithm, designed to prevent timetable clashes and equate the number of students in each class, governed this timetable. * Thus, which day the student attended was partly dependent upon the other units in which they were enrolled but partly random as well. |
|  | Inclusion of aspects employed to help minimize potential bias induced due to non-randomization (e.g., matching) | * The algorithm that allocated students to classes was designed to control grade point average. Thus, grade point average in the Tuesday and Wednesday classes were roughly equivalent. |
| 9. Blinding | Whether or not participants, those administering the interventions, and those assessing the outcomes were blinded to study condition assignment; if so, statement regarding how the blinding was accomplished and how it was assessed. | * To diminish demand characteristics and similar biases, the person administering the intervention—the lecturer—was not informed of the study hypotheses. |
| 10 Unit of analysis | Description of the smallest unit analysed to assess intervention effects (e.g., individual, group, or community) | * The engagement of each individual was included in the analyses |
|  | If the unit of analysis differs from the unit of assignment, the analytical method used to account for this (e.g., adjusting the standard error estimates by the design effect or using multilevel analysis) | * NA |
| 11 Statistical analysis | Statistical methods used to compare study groups for primary methods outcome(s), including complex methods of correlated data | * A mixed effects regression model was conducted to ascertain whether engagement of each student at both times—as measured by both the questionnaire and assessment of concentration—differed between the two conditions. In particular, a structured covariance matrix was utilized to… |
|  | Statistical methods used for additional analyses, such as a subgroup analyses and adjusted analysis | * Furthermore, to gauge the validity of these measures, Table 1 presents the correlations between the student engagement scale, concentration during the lecture, and inattention during the survey after both the first lecture and last lecture. |
|  | Methods for imputing missing data, if used | * The data from individuals who completed the survey at only one time were included in the analyses. Hence, missing data were not imputed. |
|  | Statistical software or programs used | * SPSS Version 22 was utilized to conduct these analyses. |

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| Results | | |
| Item | Description of the item | Example |
| 12 Participant flow [Often include a diagram] | Enrolment: the numbers of participants screened for eligibility, found to be eligible or not eligible, declined to be enrolled, and enrolled in the study  Assignment: the numbers of participants assigned to a study condition  Allocation and intervention exposure: the number of participants assigned to each study condition and the number of participants who received each intervention | * In this study, 60 students were allocated to each of the two classes. However, only 55 and 50 students attended the first Tuesday and first Wednesday class respectively. In addition only 51 and 48 of these students completed the survey during the first Tuesday and first Wednesday class respectively. * Furthermore, 48 and 45 of these students completed the survey during the last Tuesday and last Wednesday class respectively. * Two students attended the last class, but not the first class; these individuals did not complete the survey, however. * All the completed surveys were included in the data analysis, even if participants completed the surveys during one time only. |
|  | Follow-up: the number of participants who completed the follow- up or did not complete the follow-up (i.e., lost to follow-up), by study condition | * NA |
|  | Analysis: the number of participants included in or excluded from the main analysis, by study condition |  |
|  | Description of protocol deviations from study as planned, along with reasons | * Contrary to the protocol, one participant attended both the Tuesday and Wednesday sessions. * The responses of this participant were excluded from the analyses. |
| 13 Recruitment | Dates defining the periods of recruitment and follow-up | * The first Tuesday and first Wednesday classes were organized in February 2018. Participants received a plain language statement during these classes. The last Tuesday and first Wednesday classes were organized in May 2018 |
| 14 Baseline data | Baseline demographic and clinical characteristics of participants in each study condition | * Table 1a presents the mean age, the percentage of males and females, and percentage of domestic and international students in each condition during the first Tuesday and Wednesday. * Table 1b presents the same demographics but during last Tuesday and Wednesday. |
|  | Baseline characteristics for each study condition relevant to specific disease prevention research | * Table 1c presents the same demographic characteristics across the entire university. |
|  | Baseline comparisons of those lost to follow-up and those retained, overall and by study condition | * NA |
|  | Comparison between study population at baseline and target population of interest | * As these tables indicate, the age, gender profile, and international status of students in this sample and in the university overall are comparable. |
| 15 Baseline equivalence | Data on study group equivalence at baseline and statistical methods used to control for baseline differences | * These tables indicate that mean age and percentage of domestic and international students does not differ significantly between the Tuesday and Wednesday classes. * However, the proportion of females is higher in the Tuesday classes relative to the Wednesday classes. * Hence, gender was controlled in the mixed effects regression model |
| 16 Numbers analysed | Number of participants (denominator) included in each analysis for each study condition, particularly when the denominators change for different outcomes; statement of the results in absolute numbers when feasible | * The responses of 102 participants were subjected to the first mixed effects regression model… |
|  | Indication of whether the analysis strategy was “intention to treat” or, if not, description of how non-compliers were treated in the analyses | * NA. |
| 17 Outcomes and estimation | For each primary and secondary outcome, a summary of results for each estimation study condition, and the estimated effect size and a confidence interval to indicate the precision | * Table 2 presents the B coefficients, t values, semi-partial correlation, and 95% confidence interval of the B coefficients for each predictor as well as the R squared value. |
|  | Inclusion of null and negative findings | * NA |
|  | Inclusion of results from testing pre-specified causal pathways through which the intervention was intended to operate, if any | * NA |
| 18 Ancillary analyses | Summary of other analyses performed, including subgroup or restricted analyses, indicating which are pre-specified or exploratory | * Table 3 presents the analyses after excluding participants who did not complete the survey within 2 days. As this table shows… |
| 19 Adverse events | Summary of all important adverse events or unintended effects in each study condition (including summary measures, effect size estimates, and confidence intervals) | * Interesting, subsequent interviews indicated that some participants maintained the causal attire was unprofessional. |

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| Discussion | | |
| Item | Description of the item | Example |
| 20 Interpretation | Interpretation of the results, taking into account study hypotheses, sources of potential bias, imprecision of measures, multiplicative analyses, and other limitations or weaknesses of the study | * Consistent with the hypotheses, both measures of engagement were elevated whenever the lecturer wore casual attire. This effect of clothes, however, was not as pronounced after 12 weeks. * Nevertheless, many other differences between the two days, such as the weather, could explain this disparity between the Tuesday and Wednesday classes. * Other disparities between the conditions could explain the findings. Students allocated to the Tuesdays tended to be studying social work—indicating these students might be more interested in mental health, the topic of this lecture series. |
|  | Discussion of results taking into account the mechanism by which the intervention was intended to work (causal pathways) or alternative mechanisms or explanations | * The results are consistent with the notion that formal attire primes memories of conventional circumstances and can diminish a sense of creativity and exploration * Alternatively, the students might feel a greater sense of connection with lecturers who wear casual attire |
|  | Discussion of the success of and barriers to implementing the intervention, fidelity of implementation | * NA |
|  | Discussion of research, programmatic, or policy implications | * NA |
| 21 Generalizability | Generalizability (external validity) of the trial findings, taking into account the study population, the characteristics of the intervention, length of follow-up, incentives, compliance rates, specific sites/settings involved in the study, and other contextual issues | * In this study, all the participants were psychology students. In other disciplines, students might not associate casual attire with creativity. For example, in business, students might associate casual attire with unprofessional behaviours, and thus such attire might elicit a distinct sequence of reactions. * In addition, many other features, besides whether the attire was casual or formal, could have differed between the conditions. To illustrate, the formal attire covered the lecturer and, therefore, could have induced more sweat. The sweat might have influenced the responses of students. |
| 22 Overall evidence | General interpretation of the results in the context of current evidence and current theory | * These results vindicate the proposition that informal clothing might foster creativity, and that such creativity might promote student engagement. * Nevertheless, to substantiate this account, future research should assess whether creativity does indeed mediate the association between casual attire and student engagement. |

**References**

Des Jarlais, D. C., Lyles, C., Crepaz, N., & the Trend Group (2004). Improving the reporting quality of nonrandomized evaluations of behavioral and public health interventions: The TREND statement. American Journal of Public Health, 94, 361-366. For more information, visit: http://www.cdc.gov/trendstatement/