CEL Procedures for Running Experiments, Collecting Data, and Archiving Material

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The following document provides a set of procedures that should be followed by all of those working in the CEL. These procedures have been designed on the basis of prior experiences in the lab, and in consultation with many lab members, past and present. The goal of these procedures is to make sure that everyone provides clear documentation for each experiment, including details of experimental design, data recording, analysis and archiving. Though I recognize that not all experiments will fit neatly into the following procedures, and that as time goes on, we may need to make modifications, treat this as a starting point, and please follow these details.

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1. Experimental methods and protocols.

The lab has long had a tradition of writing out protocols for experiments, often followed by archiving on our web site. This tradition should continue, and here I would like to spell out in greater detail what is entailed with writing up such protocols.

It is often the case that in the early stages of research, a good deal of pilot work is necessary. As a result, the experimental methods used in this phase will often change by the time the experiment is fully functional. That said, even pilot research in the earliest stages of development should only be started once a protocol has been written up. The classic approach for most of the work in the lab is that you, the experimenter, approaches me and we chat about the general idea, laying out general methods and hypotheses. Next, the experimenter passes on a protocol to me and any other lab members involved in the work. This preliminary protocol should have all the ingredients of a full fledged protocol, and specifically, at least the following:
(1) Principal investigator's name
(2) Start date of experiment
(3) Descriptive title for experiment
(4) All other personnel involved in the experiment
(5) Test population (if nonhuman animals, a list of all subjects)
(6) A 1-2 paragraph introduction to the experiment providing a rough sketch of the main ideas and relevant background information
(7) Specific hypotheses and predictions
(8) General methods: this should be a general discussion of stimuli, counterbalancing, sample size, expected statistics, test groups, conditions, and subject assignment to groups. This section should also describe all precautions against unconscious biases, as well as details of coding and analysis (see Section 2 as well). It is clear that in the preliminary pilot phases of research, an experimenter will not have a complete sense of coding and analyses as new issues will emerge over the course of running the experiment. By the time the experiment is fully underway, however, this section should be completely revised so as to describe in detail how the coding is carried out, how biases are avoided, and how the analyses follow from the coding. It is useful to have this in place early as it will, ultimately, provide the material for the Methods section of a paper.

(9) Handbook description: Unlike a methods section that ultimately makes its way into a published paper, I expect these to be extremely detailed. In fact, they should read like a handbook that one could hand to a naïve experimenter. It should enable the experimenter to run the entire experiment from A to Z. What does this mean? For all experiments, there should be a description of:

-where the experiment is being run (building, room, University, Country, internet site)

-type of computer used (name brand and model number)

-description of video camera, speakers, microphones, etc. Basically, the brand names and model numbers for all equipment

-software used (e.g., Psyscope, Flash, Hypercard, Matlab) and version number

-what the experimenter actually does when setting up the experiment:

• for captive animals such as the tamarins, this will be a description of, e.g., taking the animal out of its home cage, transporting it to a test room, transferring it to the test cage, checking to make sure the cage is secure, turning on the video camera, checking the stimuli to make sure they are correct for the experiment and for the subject, checking the speakers for proper volume, checking cables

• for wild animals, such as the rhesus, this will be a description of some of the same checks on equipment for wild animals, but also, a check on testing situation, and making sure that subject is not distracted.

• for human subjects, again, all protocols should include a rich description of checks on equipment prior to running, as well as details on how a subject is run (e.g., information given to subject about the experiment, details of computer and software)

-what the experimenter does when the session ends (e.g., hitting stop on the video recorder, taking animal subjects back to their test room, recording all relevant information about the test environment for wild animals, giving human subjects a consent form).

In summary, the "handbook" can not be too detailed! And again, imagine handing this to someone who doesn't know a thing about the work. You would want this person to be able to run the experiment without your help.

2. Data coding and analysis

I think it is always advisable to carry out exploratory analyses early on in an experiment. Leaving analyses until an experiment is finished can be dangerous: specifically, methods often fail to generate interpretable data (i.e., as opposed to predicted or expected results), and it is better to catch this early. There is no danger of biasing here as long as one has described, in advance, the requisite sample sizes for the various experimental conditions. In other words, one should not run exploratory analyses with the idea that if, the current data set yields statistically significant differences, then this is the end of the experiment. Rather, the exploratory analyses provide a way to assess, early on, whether the method is yielding interpretable data, regardless of the pattern obtained. It also gives the experimenter a sense of the kind of behavior or responses that might be coded.

Given the variety of projects going on the lab, there will be different issues for coding and analysis. In the case of animal work, it is essential to find ways of remaining blind to experimental conditions. Thus, for example, in work involving auditory perception and either orienting or vocal responses, it is important to code the responses "blind" to the material presented. The way the CEL has achieved this is by using digital software such as Adobe

Premiere, FinalCut Pro, or iMovie. With a digital file loaded, first save this file with a filename that provides no distinctive information about the condition or stimuli played. Second, use the system of digital flags or markers to indicate when different periods of the experiment start and stop. For example, in playbacks, one often marks the onset and offset of the playback, as well as a 2sec post-playback period. With these flags in place, the experimenter can then blind code by simply advancing to each flag and noting whether the subject turned toward the speaker or not. This system has also been used for looking and reaching studies with tamarins, rhesus and chimpanzees.

Human data provide different challenges. In the case of our internet samples, it is often important to keep demographic information out of view, which can be readily achieved by creating different data files, some with this information and some without. For such samples, however, it is also important to set criteria that will enable one to objectively eliminate some subjects; for example, there is a floor for reading times, and subjects falling below this are unlikely to have read the text and thus, can be eliminated.

Methods for coding, like methods for data acquisition, require clear descriptions in order to ensure high inter-observer reliabilities. Usually, in the early stages of an experiment, it is necessary for two or more observers to sit down with material and code together. During this phase, operational definitions of responses usually emerge. Once they do, the next step is to write them down. And again, the richer the description the better. Further, for all materials that have been videotaped, it is best to extract examples that fit the description of a response or behavior. Thus, for example, in playback experiments involving an orienting response, it is helpful to provide links to clips showing a clear response, a clear non-response, and both ambiguous and bad responses. For data collected on the internet, or with patient populations, it is important to set up criteria for when a response is too slow or is likely to be an error.

Once coding criteria are set, at least two observers should code a sample of trials, independently. With these scores, some measure of reliability should then be quantified. Cohen's kappa is often used, but correlations are also simple and easily interpreted. If the inter-observer reliability score is insufficiently high (>80%), the observers should sit down with this sample, and recode together, noting points of disagreement. This process should be reiterated until high inter-observer reliabilities are obtained. All new members of the lab are trained by experienced members until inter-observer reliabilities are high.

3. Archiving data

3.1. Video material

Many experiments carried out in the lab and in the field (Cayo Santiago, Tchimpounga) use video cameras. Some cameras use digital tapes while others record directly onto a hard drive. For all experiments recorded onto video, it is essential that each tape is clearly labeled so that they can be subsequently analyzed, even years after the work has been carried out. For each video tape, the experimenter must <u>clearly</u> label the tape (on the spline and on the top, with pen) with the following information:

> (1) Experimenter's name, (2) Descriptive title for the experiment, (3) Species or Population tested, (4) Start and End Date for the experiments on the tape, and (5) a marking of Original, Dubbed or Edited.

The following represents an example of what I have in mind for a label:

Experimenter's name: M. Hauser Experimental Title: Habituation-Discrimination experiment testing $A(X^n)A$ with speech syllables Species: Dogs Start — End Date: 1/3/08 — 1/14/08 Original/Dubbed/Edited Tape: Original

Please use the labels and tape boxes that accompany the tape brand; if for some reason, the box or label are missing, please make a note on the label or box that you are using an alternative. Accompanying the tape should be a text document that must include the following information:

(1) Identify the tapes that are part of the experiment

(2) For each tape, provide an indication of the order in which subjects appear on the tape and the materials that they were presented with.

(2) Reference the protocol that is linked to these experiments

(3) paste in a photograph or illustration showing details of the experimental set up, making sure that the image indicates the relevant details, including, for example, the position of the camera or cameraperson, the location of the speaker relative to the subject's location, and items presented if visual.

(4) Reference any files that were used for presentation, including the location of audio materials

3.2. Audio material

Whenever recordings are made, it is essential that either the audio tape or digital file be properly labeled. For audio cassettes, whether analog or digital, please label with the following information:

> (1) Experimenter's name, (2) Species or Population recorded, (3) Observations or Experiments, (4) Start and End Date for the observations/experiments on the tape, and (5) a marking of Original, Dubbed or Edited.

3.3. Computer data files

Excel is the primary program we use for creating data files, but others may use different programs. Regardless of the program used, data files must be properly identified with file names for subsequent access, and critically, the file structure must include sufficiently descriptive labels for variables that they can be looked at in the future. Thus, although it is common to label column headers for variables with abbreviations, these abbreviations should be clearly spelled out at the top of the file. Additionally, any abbreviated entry codes should also be spelled out. Here's an example of what I have in mind, and should be used as a template.

Hypothetical Excel File:

ID	COND	TimeStamp	Age	Ethnicity	NumbBooks	Question	MoralScale
1	2	4:43:25	34	W-NHSP	4	3	4
2	3	7:24:15	21	B-NHSP	0	2	6
3	2	9:17:03	56	A	9	3	6

Given this file, the experimenter should enter above the top row an explanation of each variable and the kinds of entries that it will take:
ID: this is the subject ID that is automatically created by the MST when subjects log on.
COND: this is the order of questions that each subject received, based on the filename "Utilitarian_Dilemmas_010308.doc"
TimeStamp: this is the time that subject ID logged on to take test and is based on 24 hour clock
Age: this is the subject's age in years
Ethnicity: this is the subject's ethnicity based on the predefined categories. W-NHSP is White-NonHispanic, B-NHSP is Black NonHispanic, A is Asian, etc…
NumbBooks: is the number of books in moral philosophy or psychology that each subject has read
Question: is the specific question a subject answered, referenced to the document "Utilitarian_Dilemmas_010308.doc"
MoralScale: the value from 1-7 of moral permissibility, with 1=forbidden, 4 = permissible and 7 = obligatory

Data files that are subsequently generated from statistical packages, such as SPSS, should be similarly annotated. These data/analysis files should also be annotated with a description of the statistics, the hypothesis under consideration, and a verbal description of the result.

3.4. Storage of material

3.4.1. Video and audio tapes

All video and audio material should be kept in the designated area in the lab. There are cabinets for this material. Please ask the Lab Manager for an appropriate location. Digital audio or video should be backed up on to DVDs or external hard drives.

3.4.2. Computer files and backups

It is up to each experimenter in charge of an experiment to back up his or her data. In the case of video or audio material, the suggestion is to make CD or DVD backups of all primary material, and file these in 3-ring binders. For computer files, each experimenter should minimally back up these files onto CDs or DVDs, but I would strongly suggest putting materials onto the Harvard server or a second external hard drive.