Criteria for Authorship
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A substantial creative contribution in one or more of the following phases of research is sufficient in my lab to warrant inclusion as an author of the paper reporting the experiment(s). A lesser creative contribution warrants an acknowledgement in the footnote of the paper. I determine whether someone deserves either of these credits, and determine the ordering of authors, by counting up each person's contribution to each phase. As noted below, I assign a larger weight to the first and last phases, and to any other phase that requires special expertise or creativity (e.g., data analysis, in some cases).

In my lab, we consider 6 criteria, and weight them as follows; often the "points" at each stage are divided among several people. If a person *contributes creatively* at any of these phases, that is enough to qualify him or her for an acknowledgment or as a co-author, depending on the magnitude of the contribution. Moreover, the "replaceability criterion" leads us to ask whether one person's contributions could just as easily have been made by others; if not (i.e., if the person would have been difficult to replace), that contribution is weighted more highly.

The point totals of each phase should be agreed upon in advance; some projects, for example, use standard designs (e.g., "Stroop") or analyses (e.g., correlations), in which case the number of points for that phase should be reduced.

The following are "default" point values, with a total of 1000. The total points for each phase is divided among authors in proportion to their contribution in that phase of the project. In my lab, if someone contributed more than 0 but less than 10% of the total number of points, they are acknowledged in the footnote. If they contributed at least 10%, they are an author, and the ordering of authorship is determined by the relative number of points.

1. The idea (250 points): Without the idea, nothing else happens. If the idea grew out of a discussion, all who contributed get "credit"--but perhaps not equally so, if one or more people were primarily responsible for the insights leading to the best way to pose the question to be answered by the research and the logic of the design.

2. The design (100 points): The details of the design include counterbalancing issues, control conditions, whether a within-subjects or between-subjects design is used, and so on. A bad design later will render the results useless, so this is a critical step.

3. The implementation (100 points): Someone must implement the design into actual materials, devise instructions, and so on. To the extent this is simple boilerplate (a variation on well-developed methods using available materials), this step may be given much less weight (perhaps only 5 points). Typically the

person doing the implementation is supervised closely, so some of the points may go to the supervisor.

4. Conducting the experiment (100 points): The person who tests subjects *can* earn up to 100 points, but may earn merely 5 points if all they do is mindlessly test subjects. Authorship is awarded only to those who contribute substantially and creatively to a project; if someone is receiving class credit or payment and all they do is follow instructions and test subjects, this is worthy of an acknowledgment in the paper, but not authorship. On the other hand, if they notice what subjects are actually doing and make constructive suggestions for how to improve the experiment, this qualifies them to be included as an author. Specifically, if one notices problems in the method or procedure, and makes constructive suggestions about how to repair them, observes interesting hints about what's really going on in the debriefings, and so on, this counts as a substantial creative contribution at this stage.

5. Data analysis (200 points): Simply running the data through an ANOVA program is not enough to earn authorship at this phase. However, devising some new way to look at the data (e.g., as difference scores or ratios of some kind), or otherwise contributing a novel insight into the best way to reveal the underlying patterns in the data, may be sufficient. Particularly labor-intensive or creative data analysis, such as involved in PET and fMRI, can "earn" the full number of points. Depending on the project, the maximum of 200 points may or may not be allocated.

6. Writing (250 points). Nothing happens if the results are not reported. Writing is usually shared by several people. Credit is allocated primarily to the one who shapes the conceptual content, although a good and insightful literature review also counts heavily. If someone writes a first draft that is not used at all, this does not contribute towards points: good intentions are not enough; the question is who has contributed how much to the final product. Similarly, the sheer amount of time one has spent on the project is not relevant; competent people who work more efficiently should not be penalized.

The key to fair allocation of authorship, and equitable ordering, is to have criteria that are known to all and that all can discuss. It is best to walk through each of these criteria at the outset of the project. In addition, in my lab each contributor sends his or her own assessment of their contribution after the project is relatively complete but *before* the paper is written. If someone is near the total required to be an author but not quite there, they are offered the opportunity to take a larger role in the writing or data analysis process—thereby allowing him or her to accrue more points.