

Bold conjectures meet open science: Accelerating theory development in social psychology by testing riskier predictions via pre-registration

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Abstract

A theory is corroborated – and hence cumulative knowledge develops – to the extent a theory has survived risky tests it has been subjected to. Such Popperian falsification of theories in psychology, however, is difficult to achieve in practice because of problematic auxiliary assumptions required to observationally test a theory ($T \& A \& C \rightarrow O$). For instance, a failed prediction ($\sim O$) could be due to the falsity of the theory ($\sim T$) or problems with auxiliary assumptions ($\sim A$, e.g., construct validity problem of a measure) or problems with experimental conditions ($\sim C$, e.g., experimental manipulation problem). Such falsification difficulties significantly retard progress in our theoretical understanding of psychological phenomena. In our proposed article, we will argue that the combined practice of (1) making more specific and detailed theoretical predictions and (2) using more open science practices via public pre-registration will substantially increase our ability to falsify theoretical predictions and hence accelerate theory development and cumulative knowledge of social psychological phenomena. We will support our argument via two concrete examples from the behavioral priming and adult attachment literatures.

Another thing I must point out is that you cannot prove a vague theory wrong....[For example] 'A' hates his mother. The reason is, of course, because she did not caress him or love him enough when he was a child. But if you investigate you find out that as a matter of fact she did love him very much.... Well then, it was because she was over-indulgent when he was a child! By having a vague theory it is possible to get either result. The cure for this one is the following. If it were possible to state exactly, ahead of time, how much love is not enough, and how much love is over-indulgent, then there would be a perfectly legitimate theory against which you could make tests. It is usually said when this is pointed out, 'When you are dealing with psychological matters things can't be defined so precisely'. Yes, but then you cannot claim to know anything about it. (Feynman, 1965, pp. 158-159)

As Feynman put it so very clearly, a theory capable of generating only vague hypotheses that accommodate almost any outcome is not falsifiable and therefore is useless for developing accurate explanations of how things work. On the other hand, a theory capable of producing more specific hypotheses that predict precise outcomes prior to data collection are falsifiable and therefore much more valuable for establishing valid explanations of phenomena. Psychological constructs, however, vary in the degree of existing empirical support (Cronbach & Meehl, 1955), and therefore vary in the degree that researchers feel comfortable making more definitive hypotheses involving these constructs, particularly in research contexts that attempt to extend the boundaries of the existing nomological network. It is therefore possible, and indeed is common occurrence, for psychological researchers to generate falsifiable hypotheses that do not precisely predict the specific context and exact nature of the expected pattern of findings for particular outcomes (including not specifying specific operationalizations of variables, Meehl, 1967, 1978). This approach has the apparent advantage of being able to explain a greater range of study outcomes as supportive of the hypotheses, however, has the serious disadvantage of making it difficult – if not impossible – to falsify substantive theoretical predictions.

To make matters worse, it is also common practice for psychological researchers to not pre-register hypotheses and methodological details in advance of collecting data

to test their hypotheses, but to only disclose these details, to varying degrees, when submitting a manuscript for publication. Unfortunately, the combination of imprecise hypotheses, along with a lack of transparency in the development of the hypotheses as well as methods to test them, increases the likelihood that a theory with no verisimilitude can nonetheless eventually be supported with theory-confirming results (Greenwald, Pratkanis, Leippe, & Baumgardner, 1986; Meehl, 1978).

In our proposed paper on “Rigorous and Replicable Methods in Social Psychology” , we will argue that we can learn a lot more about social psychological phenomena by (1) developing more definitive hypotheses (e.g., specific contexts & operationalizations, point predictions), and (2) pre-registering these hypotheses (and proposed methods) prior to data collection (Wagenmakers, Wetzels, Borsboom, van der Maas, & Kievit, 2012). To support our argument, we will discuss three ways these two practices, combined, can achieve this goal:

- (1) It will motivate researchers to develop stronger experimental designs using more rigorous methods and to more carefully select or create particular measures that are believed to optimally assess the constructs under study, which will reduce the set of ad hoc explanations available to explain away failed predictions (i.e., reduce the number of "plausible outs" in Meehl's, 1967 parlance);
- (2) It will motivate researchers to work harder to develop tighter derivation chains running from the theory, via the auxiliary assumptions, to the predicted observational relations (Meehl, 1990, p. 199), which means riskier predictions; and,
- (3) It will allow other researchers to gauge more objectively all of the successive changes in methodological procedures that had to be made in order to get a theory-confirming experimental result.

We will use two concrete examples (one focusing on behavioral priming and one focusing on adult attachment) of theoretically derived hypotheses that can vary in precision of predictions to illustrate the advantages associated with more precise hypotheses that are pre-registered in advance of data collection for enhancing knowledge development in social psychology. As can be seen in Table 1, making more specific theoretical predictions using open and pre-registered research practice leads to maximal falsifiability and hence maximizes knowledge development.

Table 1. A 2 x 2 table representation of our main argument.

| | | Hypothesis/Prediction | |
|--------------------|---------------------|--------------------------------------|---------------------------------------|
| | | Vague | Specific |
| Research practices | "Closed" | A Non-falsifiable | B (Privately) Semi-falsifiable |
| | Open/pre-registered | C (Publicly) Semi-falsifiable | D Falsifiable! |

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Maximal knowledge development

In summary, *combining* the practice of generating more definitive and detailed theoretical predictions with open science/pre-registration practices render theoretical predictions substantially more falsifiable, and hence will enhance and accelerate our theoretical understanding of social psychological phenomena.

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