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INVITED COMMENTARY

Comparing Theories of Health Behavior Using Data from Longitudinal Studies: a Comment on Gerend and Shepherd

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The publication of Gerend and Shepherd's paper [1] on HPV vaccine initiation among young adult women marks a rare event in the health behavior theory literature. Despite the eloquent "call to arms" for comparative theory testing by Noar and Zimmerman [2] and Weinstein and Rothman [3] over 7 years ago, this most recent effort brings the number of longitudinal studies that test health behavior theories against one another to a grand total of just 11. How is it possible that such a worthy project has been so neglected? Comparative testing of whole theories is both conceptually and procedurally complex, and many researchers may be loath to subject themselves to the intensive data collection and intricate analyses that Gerend and Shepherd have so admirably performed. We would like to suggest an additional strategy for testing the underlying logic of health behavior theories.

Our main concern is the difference between what Darwin in 1857 called the lumpers and the splitters [4, 5]. One can compare theories as more-or-less coherent families of constructs, as Gerend [1] and many others have done and as, for example, Noar [2] recommends. However, one can also disassemble theories into their constituent parts so as to compare specific aspects of different theories (e.g., Weinstein [6]). We believe that this latter approach holds great potential for advancing the field. To illustrate this point further, we contrast two ways of testing theories: a summary approach (that leads to lumping) versus competitive hypothesis testing (that leads to splitting).

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In the *summary approach*, each theory is treated as a distinct system of constructs. To compare two theories using this approach, one operationalizes and measures each system and then looks at how well the two sets of predicted relationships fit the actual data, either separately or in unison. In the more ornate case of structural equation modeling, model fit statistics, such as the comparative fit index, tell us whether the many pathways specified in a path diagram adequately fit the underlying data. For a single outcome, statistics such as R^2 give a sense of how much of the variability in the outcome the predictor variables explain. Together, these statistics should give us a way to holistically compare the predictive power of two theories so as to arrive at the "correct" choice just by looking at the numbers.

As is so often the case with statistical analysis, the process is less straightforward in practice. The appeal of the summary approach is that it would seem to recognize each theory as a unified whole, something with narrative force, rather than a lifeless collection of boxes and arrows. In reality, however, researchers have cross-pollinated health behavior theories to such an extent that any one theory has many variations, all of which may have quite a bit in common with a theory of a different name. Does self-efficacy belong in the Health Belief Model (HBM) [7]? Does the Theory of Planned Behavior (TPB) have exclusive claim to behavioral intentions [8, 9]? Inevitably, researchers struggle with these questions, performing numerous iterations of their analyses in order to pinpoint the theories' true identities. A common conclusion is that one should lump some parts of one theory together with some of another, and as in the case of Gerend and Shepherd's paper, the summary approach can yield findings that extend our understanding of the behavior and the theories used to model it. A difficulty in the summary approach, however, is that composite theories tend to drift from the perspective or ideologies that originally motivated the theories.

For this reason, a second approach to theory testing is also valuable, *competitive hypothesis testing*. In this approach, one

Table 1 Competing predictions from two theories of health behavior

	Health Belief Model	Theory of Planned Behavior
Risk beliefs	Main effects of perceived likelihood and severity	Interaction of perceived likelihood and severity
	People who perceive higher likelihood of harm will be more likely to get vaccinated. *People who perceive higher severity of harm will be more likely to initiate the three dose HPV vaccine series.*	*People who perceive at least some likelihood of harm and some severity of harm will get vaccinated.*
Self-environment fit	Main effect of self-efficacy	Interaction of perceived behavioral control and intentions
	People with higher self-efficacy will be more likely to get vaccinated.	*People who intend to act and have higher perceived behavioral control [which includes self-efficacy] will be more likely to get vaccinated.*

Note In some interpretations of the theory of planned behavior, perceived behavioral control exerts only a main effect on behavior

treats a theory not as an unbreakable whole, but rather as sets of specific arguments about how the world works. An assumption is that predictions from a theory are separable: some can be right even as others are wrong. Isolating and testing these differences can, in our opinion, effectively advance theory comparison and evolution, and it can shed light on the perspective that motivated the theory in the first place. To conduct such an analysis, one identifies areas where two theories yield competing or contradictory predictions about the presence and direction of an association between two or more variables, and then one looks at the data to see which is right. Such competitive hypothesis testing is the cornerstone of psychological research. Though not as common as one might hope in health psychology, competitive hypothesis testing simply does not exist in the context of any of the 11 existing papers that test multiple health behavior theories using longitudinal designs.

To further illustrate the potential of this alternative, let us consider how we might go about competitive hypothesis testing in the context of Gerend and Shepherd's [1] comparison of the HBM and TPB with regard to HPV vaccine initiation. Although these theories overlap in significant ways, we can identify at least two important differences in how they handle risk and efficacy beliefs (Table 1). First, HBM predicts likelihood and severity beliefs will be simple predictors, whereas TPB predicts an interaction of these two variables [6]. Second, if one accepts the latter-day addition of self-efficacy to HBM [10], one can compare this simple construct in the HBM to the more broadly defined idea of perceived behavioral control in the TPB (e.g., Aijzen [11]). Thus, in at least two cases, the "splitter's approach" of competitive hypothesis testing could build on Gerend and Shepherd (2012) holistic comparison of HBM and TPB by targeting specific differences between the two theories. Competitive hypothesis testing in experimental studies could do even more to arbitrate these differences.

Darwin believed that lumpers and splitters both add value, and we likewise argue that for health behavior theories to evolve, we must take a multipronged approach. For example, the assertion that intentions might improve the HBM is a lumper's idea, and the data presented by Gerend and Shepherd [1] show the clear value of asking such a question. Furthermore, although few in number, the methodologically strong longitudinal studies of Gerend and Shepherd and others suggest that health behavior theories yield meaningfully different information about the world. We believe that researchers could supplement this existing literature with a deductive approach. Competitive hypothesis testing is an important tool for examining specific mechanisms that drive differences in the theories' predictive powers.

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