

Conceptual Logic Models and Theoretical Contributions

When reading theory in research articles, we often translate the theory into an influence diagram and then use that diagram to help identify gaps in the theory. We examine the conceptual definitions of core constructs to determine if they are clear and unambiguous. We also evaluate the *a priori* conceptual logic model for the theoretical assertions to determine if the assertions are plausible. Finally, we attend to the case the author makes for the strength of the theoretical contribution of the research. This primer provides examples of the latter two tasks. The former tasks are addressed in the supplemental materials for Chapter 7. In the current primer, we make use of the material presented in Chapters 3 and 4 in the main text and assume you have read it.

As a general comment, the page and word limits of many journals make it challenging for authors to develop their conceptual logic models in sufficient detail. As a result, a common criticism is that the conceptual logic model is underdeveloped. This is not necessarily the fault of authors, given the limited pages they have to work with.

On a big picture level, conceptual logic models are theorists' attempts to convince their audience that their *a priori* theory is viable. Sometimes they will appeal to common sense in doing so and other times they will cite past research. After reading an introduction of an article, your reaction to the stated theory should be "this makes sense." If your reaction is otherwise, the authors need to do a better job of developing their conceptual logic model.

The judged theoretical contribution of the article is the extent to which you think the article advances scientific knowledge in a meaningful way (setting aside methodological deficiencies, for purposes of our discussion). Of interest is the case the author makes for this. As discussed in Chapter 3, criteria that editors and reviewers often invoke to judge theoretical contributions are those of novelty, utility, and scope, although other criteria certainly can come into play. We will use these criteria in our analyses.

We adopt a critical orientation with respect to the two target articles. We do so in a constructive spirit with the idea of illustrating mindsets you can adopt that will improve your theorizing. We could easily be as critical or even more so of our own published research. Our intent is not to detract from the value of the targeted research articles. Rather, it is to show how the theories within them might be strengthened and extended.

THE OMIDVAR ET AL. ARTICLE

This article focused on healthy/unhealthy life styles of pregnant women. The outcomes were six facets of healthy behaviors, namely nutrition, physical activity, health responsibility, stress management, interpersonal relationships, and self-actualization. The authors sought to link each of these six outcomes to five psychosocial variables, namely, anxiety, stress, depression, marital dissatisfaction, and social support. Thus, there are six outcomes and five conceptual determinants of each. The influence diagram for this article appears in the supplemental materials for Chapter 7.

The Conceptual Logic Model

Omidvar et al.'s conceptual logic model used induction as described in Chapter 4, that is they justified the links in their theory by citing prior research that directly observed empirical support for the proposed links but in different contexts. The idea was that if other research has tested and found support for the same (or highly similar) theoretical expressions, then this suggests the proposed theory is viable and worthy of investigation. In their Introduction, Omidvar et al. state: "There is evidence supporting the presence of a relationship between healthy behaviors of pregnant women and their psychological factors" (p. 2), and then cite multiple studies in support of this. Here is the research they cite (we indicate the target construct thought to influence a healthy lifestyle, then we quote the exact statement made to support the link):

For depression and stress: "Depression and stress are major contributors to the healthy behaviors of pregnant women, especially in terms of physical activity, nutrition, and weight gain during pregnancy."

For depression: "A study reported that pregnant women with depression tend to have adverse pregnancy habits, which, in turn, have adverse effects on the outcome of pregnancy [12]."

For depression: "Another study emphasized that depression leads to inappropriate nutritional behaviors and low consumption of fruits [13]."

For depression: "There is a correlation between body mass index and depression, which is related to weight gain during pregnancy [17]."

For psychological disturbance in general (note: the authors do not indicate if this applies to depression, anxiety, or stress): “Previous studies have shown that psychological disturbance prevents the consumption of vegetables and fruits [14,15].”

For stress: “Another study reported that high stress levels during pregnancy cause weight increase in pregnant women [16].”

For stress: “Kim and Lee reported that women with low stress levels during pregnancy engage in more regular exercises than pregnant women with high stress levels [18].”

For anxiety: “Another study confirmed that pregnant women with lower physical activity levels had higher anxiety symptoms [19].”

For social support: A review article has reported that social support has a major role in changing lifestyle managements [21].

For stress and support: “Increasing or decreasing weight during pregnancy is associated with psychosocial factors such as pregnancy stress and social support [22].”

For social support: “Moreover, social support is a protective factor against pregnancy stress [23].”

For marital satisfaction: “Findings suggest a possible relationship between marital satisfaction and lifestyle. Pregnant women who have a higher marital satisfaction have healthier and more desirable diets, and less depressive and psychological problems [24].”

For marital satisfaction: “A weak marital relationship is the most stable predictor of anxiety and other health issues during pregnancy [25].”

For marital satisfaction: “In addition, marital satisfaction affects the severity of depression symptoms in pregnant women [26]. Also, some previous studies have emphasized the role of some Psychological associations of pregnancy healthy life styles.”

Analysis of the Conceptual Logic Model

The strategy that Omidvar et al. used to justify the *a priori* viability of their theory is reasonable, but there also are limitations with it. First, as noted in Chapter 4, when using this form of induction, the strength of the citations as support for a given theoretical link

is tied to the applicability of the cited research to the current theory and study. The Omidvar et al. study focused on pregnant Iranian women living in Tehran. However, much of the cited research supporting the theory was conducted in the United States. We think it would have been helpful if the authors had directly addressed this matter to alleviate concerns that the cited research may not be applicable. To be sure, critics who raise this issue should be prepared to state the reasons why the prior research would not be applicable. However, a good practice when writing scientific reports is to anticipate objections readers may have and then to directly address them.

Second, the cited research did not address all the links in the theory. Only a subset of the factors were addressed. For example, nothing was mentioned about the outcomes of health responsibility, interpersonal relationships, nor self-actualization.

Third, several of the concepts were not clearly defined (e.g. self-actualization). It would have been helpful if the authors elaborated more on the meaning of constructs. Logic models for fuzzy constructs can be difficult to evaluate (see our analysis in the supplemental materials for this article in Chapter 7).

Finally, after reading the Introduction, we would have liked to see a somewhat richer conceptual logic model that went beyond just stating that prior research has empirically linked the predictors to the outcomes. Greater discussion of *why* each proposed determinant might impact each proposed outcome would have enriched the conceptual logic model. To be sure, some such elaboration did occur, but it was reserved for the Discussion section, most of which focused only on links in the theory that were empirically supported. As well, the Discussion section generally did not go much beyond restating the results and then citing prior research that found similar results.

Making a Case for a Theoretical Contribution

Omidvar et al begin by addressing the importance of their focus in general terms:

“The healthy behaviors of pregnant women affect their pregnancy outcomes. Pregnant women who are overweight or obese (body mass index >26 kg/m²) or women with higher weight gains during pregnancy are at a higher risk for unfavorable birth outcomes, such as pregnancy hypertension, high-birth-weight baby, preeclampsia, and emergency cesarean delivery [5]. Maternal smoking is associated with higher rates of abnormal fetal heart rate tracings during labor and higher rates of low-birth-weight babies [6]. Maconchi et al. reported that intake of supplements and eating fresh vegetables daily were risk factors for spontaneous abortion during pregnancy [7]. Furthermore, studies have shown that both stress and stress management are important factors affecting pregnancy outcomes [8–11].”

It is not atypical for the Introduction of applied research reports to begin with statements about the import of the general topic area. Although this helps build a case for utility, it usually is not enough. Rather, one needs to make a case for how the specific theory being posited and tested has practical implications that are of import. Omidvar et al. attend to this somewhat in their Discussion section, but we felt the case could have been made more strongly.

The authors address the criterion of novelty/innovation by stating that:

“Although previous studies revealed that some psychological factors were associated with or related to healthy behaviors [12–27], only a few studies have explored the relationship of multiple psychosocial factors with the healthy lifestyles of pregnant women. The present study aimed to address the existing gap in the healthy lifestyle literature based on testing a model that examines the roles of five psychosocial variables on the prediction of six subscales of healthy lifestyles in pregnant women.”

and

“To the authors’ knowledge, this is the first study to use the five psychosocial variables of anxiety, stress, depression, marital dissatisfaction, and social support with six domains of healthy lifestyles of pregnant women, including nutrition, physical activity, health responsibility, stress management, interpersonal relationships, and self-actualization.”

The primary contribution Omidvar et al. appeal to for innovation is the fact that all of the predictors they studied were considered multivariately rather than in isolation. However, as noted in our discussion in the supplemental materials for Chapter 7, the authors did not, in our opinion, take advantage of articulating the complex causal relationships that likely exist among the different predictors nor among the outcomes when considered multivariately. In other words, they did not sufficiently take advantage of the multivariate opportunities in their theorizing. One way of strengthening the theory would have been to elaborate the possible causal relationships among the psychosocial determinants and the lifestyle outcomes using the heuristics described in Chapter 7 on causal models. Another possibility in support of a multivariate approach might be to apply cluster analysis (described in Chapter 3, see also Chapter 11) to the five predictors to identify multivariate patterns among them. These multivariate patterns (or clusters) could then be related to each lifestyle outcome. Or, one might apply cluster analysis to the lifestyle outcomes as well and incorporate these multivariate patterns into the theory.

Our general point here is to always try to take your theory construction efforts beyond simple extensions of past research that has demonstrated your theoretical links in other contexts. Push the prior theory in new, meaningful, conceptual directions. In the Omidvar et al. study, approaching the constructs multivariately is indeed worthwhile, but when doing so, think creatively about how to accomplish the task. What are the causal relationships among the predictors? What are the causal relationships among the outcomes? Are there naturally occurring multivariate patterns of predictors that are meaningful (and that could be isolated in a cluster analysis)? Are there naturally occurring multivariate patterns of outcomes that are meaningful? Considerable research suggests that the age of the mother (e.g., adolescent versus young adulthood) can dramatically affect lifestyle orientations during pregnancy. Could you introduce age of the mother as a moderator for certain relationships in the Omidvar et al. framework to enrichen it? Stretch your thinking!

As noted, Chapter 3 highlighted the importance of building a case for novelty, utility, and scope of one's study. Do you think Omidvar et al. could have made a stronger case relative to these criteria for their study? How would you re-write the paper to make these elements stronger?

THE ANDERSON AND BARRETT ARTICLE

The Anderson and Barrett article focused on how attributions of food sources impact food perceptions and eating behavior for meat products. Three laboratory studies were conducted to determine if the labeling of comparable meat samples as coming from a “humane farm” versus a “factory farm” (or variants thereof, under the assumption that the labels imply different levels of animal suffering) would affect (a) behavioral proclivities toward the product (likelihood of eating again, amount willing to pay), (b) sensory perceptions of the product (savory, salty, sweet, bitter, sour, fresh, greasy), and (c) positive affect for the product (likeability, enjoyableness, quality of overall taste). The influence diagram for the studies appears in the supplemental materials for Chapter 7.

The Conceptual Logic Model

The *a priori* conceptual logic model by Anderson and Barrett, like Omidvar et al., primarily used the induction strategy described in Chapter 4. This involved citing research that has tested the same or similar theoretical propositions in slightly different contexts. If other research has been supportive of similar theoretical expressions, then this suggests the viability of the proposed theoretical expressions. Anderson and Barrett cite numerous studies with other products (wine, coffee, broth, ice cream) that have shown

that food labels and induced beliefs about food products impact rated taste and preferences. They also argued (and cited supportive research) that food purchases can be based on ethical concerns (e.g., eco-friendly and fair trade labels), thus making it more likely that labels that imply animal suffering also may impact food preferences.

Anderson and Barrett made reference to “grounded cognition perspectives,” “affective and sensory neural representations” and the representation of “beliefs in regions of the brain that are associated with embodied simulation of animals’ experience.” They also cited studies that have shown animal suffering generates negative affect.

Analysis of the Conceptual Logic Model

We were persuaded of the viability of Anderson and Barrett’s core theory based on the past research they cited about the effects of labels and induced beliefs on food preferences. However, we also felt some of the research areas they called attention to (e.g., neural representations in the brain and “grounded cognitions”) seemed tangential to building a case for the viability of their theory. The authors, we felt, should have developed the relevance of this material more clearly or not included it.

As noted, when citing past research as justification for current theory, our preference is that authors make some statement about the appropriateness of generalizing from that research to the present context, even if such statements are brief. Is there anything about the prior work that would restrict the applicability of it to the current theory? Authors should directly address this matter.

Making a Case for a Theoretical Contribution

Anderson and Barrett begin their paper by appealing to the import of their general topic for health (e.g., “In the 21st century, eating choices still matter: diet plays a role in heart disease [1], obesity [2], diabetes [3], and stroke [4].”). They reinforce these points in their Discussion section: “The decision to eat meat is particularly important because eating too much can increase the prevalence of metabolic related diseases, including cancer, heart disease, and obesity [31]. Eating too much red meat, in particular, also increases mortality rates [32].” They also note that “Consumer demand for meat supports industrialized animal farming, which some argue causes mass animal suffering [15].” As noted for the Omidvar et al. study, it is not atypical for the Introduction of applied research reports to begin with statements about the import of the general topic area. Although this does help build a case for utility, one usually also needs to make a case for how the specific theory being posited and tested has practical implications that are of

import. Anderson and Barrett do so in parts of their article in the Discussion section, but we felt the case could have been stronger

Anderson and Barrett’s review of prior research about the effects of food labels on food experiences was convincing but it also raised questions to us about the novelty of their work. This is a “side-effect” of using this strategy for building a strong conceptual logic model, as discussed in Chapter 4; you convince the reader that prior research has already demonstrated what your research is seeking to demonstrate – hence the study is not that novel. Perhaps the study would have had more theoretical clout if it had included mediators and/or moderators (see the influence diagram for their study in the supplemental materials for Chapter 7). If Anderson and Barrett had applied the causal thinking heuristics described in Chapter 7 of the main text, perhaps a richer, more novel theory would have evolved. As it stands, the study explored fairly simple, bivariate, direct causal effects that had already been explored in prior research, albeit in different contexts.

The main appeal to novelty made by Anderson and Barrett was as follows: “Emerging research has explored whether beliefs about food production influence consumption experiences [11–13, 34], but no work has focused on meat.” This, to us, is not all that original. The statement conveys to us, instead, a somewhat narrow focus in terms of scope. Having said that, we recognize certain constituencies in the meat/grocery industry and/or in meat advertising might find the results to be compelling, suggesting publishing the work in a journal that would reach that audience.

In the Discussion section, Anderson and Barrett invoke basic processes in human information processing to extend the theoretical reach of their study. One phenomena they introduced is that of *negativity bias*. By way of background, their second study included a control condition with no label attached to the meat so that they could determine if the “humane farm” label increased food evaluations relative to a no label control and if the “factory farm” label decreased food evaluations relative to a no label control. They found support for the latter but not the former and concluded that this was consistent with the literature on negativity bias in information processing which shows people tend to give greater weight to negative information.

The strategy of embedding one’s theory into a broader theory of information processing helps build a case for broader scope of the research. However, the current effort, in our opinion, was only somewhat successful. For example, although negativity bias represents a mechanism that can account for the Anderson and Barrett results, information processing research has also demonstrated the existence of positivity bias, i.e., some people tend to give more weight to negative information (negativity bias) while others tend to give more weight to positive information (positivity bias). As well, the type

of bias invoked can shift depending on context. Our own opinion is that if Anderson and Barrett thought that negativity and positivity bias could be relevant, it would have been better to formally integrate this into their theory from the outset and in a way that builds on extant theories surrounding negativity/positivity bias. The inclusion of the no label control condition in Study 2 introduced interesting theoretical possibilities about the effects of labeling on food preferences, but the addition of the group appeared more as an afterthought in the write-up. We probably would have raised the theoretical issues in the Introduction, cited relevant research, made predictions based on the new integrated theories, and then tested them. Our goal would have been to enrich the prior research cited by Anderson and Barrett on food labeling and food preferences by integrating it with theory on negativity/positivity bias in ways that might advance theory in both domains.

Anderson and Barrett in their Discussion section raised two other plausible mechanisms that might have explained their results other than positivity/negativity bias. Consistent with heuristic 23 in Chapter 4, is it possible that all three mechanisms could have been operating rather than one or the other? What would a theory look like that permitted multiple mechanisms and how might one test it? Again, stretch your thinking.

Anderson and Barrett note that their results stand apart from prior research in certain respects: “Our finding that negative, but not positive, beliefs influence the experience of eating stands in contrast to other studies that found ‘fair-trade’ labels seem to boost the pleasantness of chocolate [12,40], and ‘local’ labels seem to boost the pleasantness of juice [12]. They speculate why these disparities might have occurred and encourage future research to explore the possibilities. The richness of many of the ideas presented by Anderson and Barrett suggest that the three studies they reported were just a “first step” toward the development of more elaborated theoretical frameworks that they suggested in their Discussion section. In this sense, the research was contributive but it would be judged more so if it actually took those next steps.

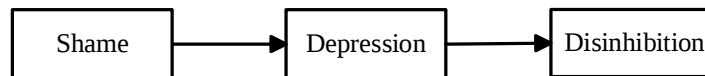
DEDUCTIVE CONDITIONAL SYLLOGISMS

The two studies considered in this document both relied heavily on the induction strategy described in Chapter 4 for elaborating an *a priori* conceptual logic model, i.e., each study justified the viability of its theoretical expressions by referencing past research that found empirical support for them in other contexts or that were supportive of theoretical expressions similar to those of the authors. Chapter 4 described deductive conditional syllogisms as another strategy for creating *a priori* conceptual logic models. On our webpage, we include a third link (called article 3) that we use here to develop perspectives on this approach. Although we do not conduct a formal analysis of the

article (by Duarte et al.), it contains examples relevant to deductive conditional syllogisms that are worth considering.

Duarte et al. posited a causal theory relating weight shame and self-criticism to depression and negative affect and, in turn, to the self-regulation of eating behavior for women in a weight loss program. The *a priori* conceptual logic model for this study was underdeveloped (the Introduction consisted of four short paragraphs), but because the study featured mediation dynamics, it allows us to make several points about deductive conditional syllogisms.

Duarte et al. hypothesized that feelings of shame about one's weight leads to depression and that depression, in turn, leads to increased frequency of episodes of binge eating (referred to as *disinhibition*). An influence diagram reflecting this mediational chain is as follows:



This mediation dynamic can be expressed as a conditional syllogism, where A = increased feelings of weight shame, B = increased depression, and C = increased disinhibition:

If A, then B

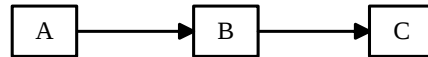
If B, then C

Therefore, if A then C

As noted in Chapter 4, if one presents a theoretical expression about the relationship between A and C, then one can assert the *a priori* viability of that expression by citing prior research supporting the two premises (or by appealing to common sense). Duarte et al. say little about the conceptual logic model for the above theoretical link. Instead, they specify the above mediation model (i.e., the full syllogism) and then test it empirically in its entirety. Testing the full syllogism is sound, but the authors should have, in our opinion, developed *some* narrative and justification/rationale for the core links in the mediational chain (i.e., for the premises of the syllogism).¹

Parenthetically, we can use the linking of conditional syllogisms to mediation in influence diagrams to illustrate in another way the vertical and horizontal structure of conditional syllogisms described in Chapter 4. As noted above, the mediation chain

¹ Duarte et al. do cite one study supporting the link between shame and depression: “Shame and self-criticism are associated with depression [30],”



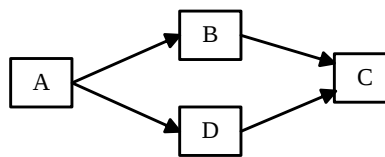
implies the conditional syllogism

If A, then B

If B, then C

Therefore, if A then C

A mediational chain with two mediators appears as follows:



This representation implies a conditional syllogism with a two level horizontal structure:

If A, then B

If A, then D

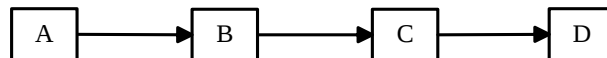
If B, then C

If D, then C

Therefore, if A then C

Therefore, if A then C

A four variable mediational chain like this:



implies a conditional syllogism with a larger vertical structure:

If A, then B

If B, then C

If C, then D

Therefore, if A then D

A priori conceptual logic models would develop a coherent rationale for each link in the respective mediational chains.

CONCLUDING COMMENTS

When you develop and present your theory, you want to build a compelling rationale for

each link in the theory. You want your audience to conclude that each link “makes sense” and is viable. There are many strategies you can use to do so. In this primer, we illustrated the strategies used in two example articles. Space constraints often get in the way of fully elaborating justifications for proposed links in an article, but it is an exercise you should engage in prior to testing and writing about your theory.

It also is helpful to consider the case that authors make about the theoretical contribution of their work. When you write an article, do not leave this to the reader to infer. Directly address it. Chapter 3 notes that many editors and reviewers judge theoretical contributions in terms of the novelty/innovation of the work, the practical utility of it, and its scope. Address these.