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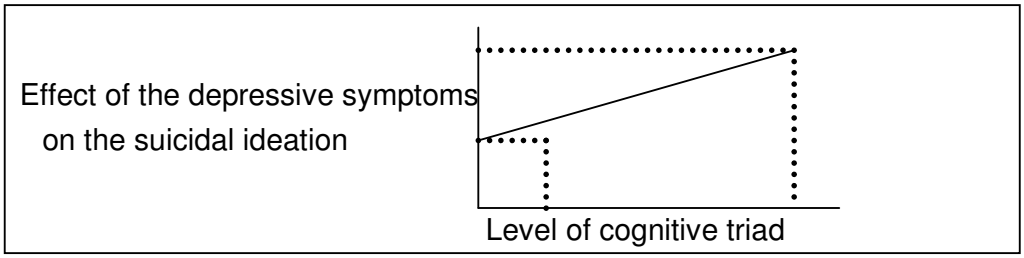
Dear Dr. Dougherty:

In view of the reader's comments, two correlated and important concepts should be further introduced to avoid misunderstanding the moderator-interaction effect in real biological or social psychological research. That is the mathematic algebraic expression in modeling the moderator-interaction effect, and the role of a third variable, either positive or negative, on the effect measures.

First of all, the classic reference which the reader also quoted on this topic is Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173-1182. The definition of moderator variables comes directly from this classic paper: "In general terms, a moderator is a qualitative (e.g., sex, race, class) or quantitative (e.g., level of reward) variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable. Specifically within a correlative analysis framework, a moderator is a third variable that affects the zero-order correlation between two other variables. In the more familiar analysis of variance (ANOVA) terms, a basic moderator effect can be represented as an interaction between a focal independent variable and a factor that specifies the appropriate conditions for its operation." *p. 1174.*

In addition, four cases are presented in this paper to introduce a way to measure and test the differential effects which are dependent in part on the "level" of measurement of the independent variable and the moderator variable. Furthermore, three theoretical diagrams therefore illustrate different ways in which the moderator changes the effect of the independent variable on the dependent variable: linear, quadratic, and step. The reader then applies one of these diagrams and uses the following figure to display the way the cognitive triad alters the effects of the depressive symptoms on suicidal ideation.



Unfortunately, the reader misapplied this theoretical diagram to our study results which may have led to a misunderstanding of our discussion as she indicated. In fact, before applying the simple forms of the X-Y axes to explain the role played by the moderator, the researcher first needs to judge the direction of each effect of this variable, since failure to adjust for it can lead either to over- or underestimation of the primary interaction of interest. Consider in a relation between an exposure (X) and outcome (Y), there is a covariate (Z). Each of the variables (X, Y, Z) can either be positively (i.e., increasing the likelihood of the other variables) or negatively (i.e., decreasing the likelihood) associated with the other. We applied knowledge of the direction of the relation (a) between X and Y and that between Z and both X (b) and Y (c), to determine the interactive effect of the third variable on the magnitude of the crude relation between exposure and outcome. The direction of the net effect corresponds to the sign resulting from multiplying the three respective relations.

In our study, the following mathematic algebraic formula was used to test the possible moderator-interaction effect. In Figure A, we demonstrate the interrelationships among the cognitive triad, depressive symptoms, and suicidal ideation.

$$Y = \beta_0 + \beta_1 \cdot x_1 + \beta_2 \cdot x_2 + \beta_3 \cdot x_1 \cdot x_2$$

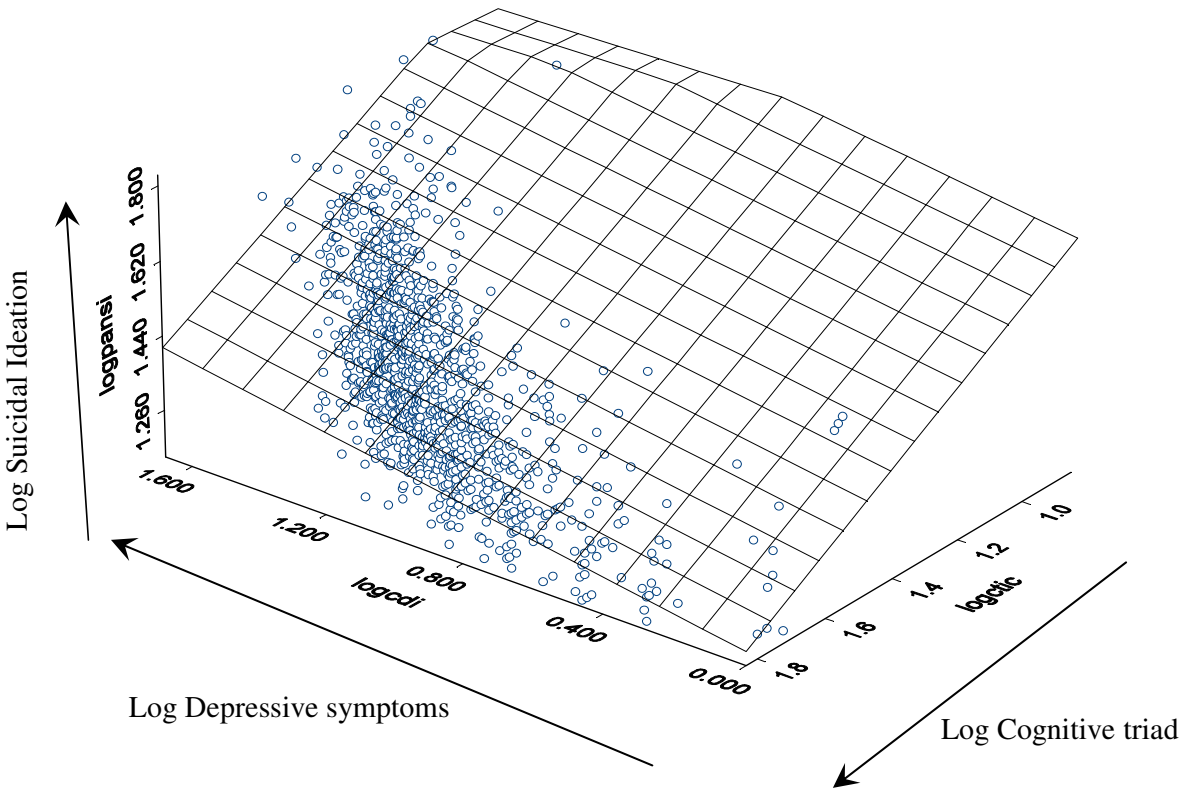


Fig. A. Empirical three-dimensional plot of modeling the interrelations among the suicidal ideation, depressive symptoms, and cognitive triad. (Analysis by S-Plus 7.0

software).

The results show that those who have a more-positive cognitive triad tend to have lower levels of depressive symptoms and suicidal ideation. In addition, the synergetic effect of depressive symptoms on suicidal ideation gradually and steadily changes (increases) when the score of cognitive triad changes **(decreases)**; on the contrary, when the score of the cognitive triad **increases,** then the effect of the depressive symptoms on suicidal ideation decreases. In other words, when those with a more-negative cognitive triad experience higher levels of depression, they tend to have a higher level of suicidal ideation. This is why the main effect in the multiple regression of the depressive symptoms on suicidal ideation was positively but not significantly related (beta = 0.38). The main effect in the multiple regression of the cognitive triad on suicidal ideation was negatively and significantly related (beta = -0.70). And the cross-product term (depression symptoms x cognitive triad) was significantly and positively correlated with suicidal ideation (beta = 0.54). Therefore, based on a nursing research point of view, the results suggest that taking into consideration the magnitude of the statistical parameters as well as the direction between all study variables may help nursing researchers better understand the applications of a moderator in future studies.

Reference:

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and, Social Psychology, 51,* 1173-1182.

Sincerely,

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