

The Utility of Network Analysis for Personality Psychology

ULRICH SCHIMMACK* and JUDITH GERE

University of Toronto Mississauga, Mississauga, ON Canada

Abstract: We note that network analysis provides some new opportunities but also has some limitations: (i) network analysis relies on observed measures such as single items or scale scores; (ii) it is a descriptive method and, as such, cannot test causal hypotheses; and (iii) it does not test the influence of outside forces on the network, such as dispositional influences on behaviour. We recommend structural equation modelling as a superior method that overcomes limitations of exploratory factor analysis and network analysis. Copyright © 2012 John Wiley & Sons, Ltd.

Key words: personality; trait; disposition; causality; structural equation modelling; network analysis

Cramer et al. (2012) introduce network analysis (NA) as a new statistical tool for the study of personality that addresses some limitations of exploratory factor analysis (EFA). We concur with the authors that NA provides valuable new opportunities but feel forced by the situational pressure of a 1000 word limit to focus on some potential limitations of NA. We also compare NA to structural equation modelling (SEM) because we agree with the authors that SEM is currently the most powerful statistical method for the testing of competing (causal) theories of personality.

One limitation of EFA and NA is that these methods rely on observed measures to examine relationships between personality constructs. For example, Cramer et al. (2012) apply NA to correlations among ratings of single items. The authors recognize this limitation but do not present an alternative to this suboptimal approach. A major advantage of SEM is that it allows researchers to create measurement models that can remove random and systematic measurement error from observed measures of personality constructs. Measurement models of multimethod data are particularly helpful to separate perception and rater biases from actual personality traits (e.g. Gere & Schimmack, 2011; Schimmack, 2010).

Our second concern is that NA is presented as a statistical tool that can test dynamic process models of personality. Yet, NA is a descriptive method that provides graphical representations of patterns in correlation matrices. Thus, NA is akin to other descriptive methods (e.g. multidimensional scaling, cluster analysis and principal component analysis) that reveal patterns in complex data. These descriptive methods make no assumptions about causality. In contrast, SEM forces researchers to make *a priori* assumptions about causal processes and provides information about the ability of a causal theory to explain the observed pattern of correlations. Thus, we recommend SEM for theory testing and do not think it is appropriate to use NA for this purpose. Specifically, we think it is questionable to make inferences about the Big Five model based on network graphs.

*Correspondence to: Ulrich Schimmack, University of Toronto Mississauga, Mississauga, ON, Canada.
E-mail: uli.schimmack@utoronto.ca

Cramer et al. (2012) highlight the ability to visualize the centrality of items in a network as a major strength of NA. However, factor loading patterns and communalities in EFA provide similar information. In our opinion, the authors go beyond the statistical method of NA when they propose that activation of central components will increase the chances that neighbouring components will also become more activated. This assumption is problematic for several reasons. First, it is not clear what the authors mean by the notion of activation of personality components. Second, the connections in a network graph are not causal paths. An item could be central because it is influenced by many personality components (e.g. life satisfaction is influenced by neuroticism, extraversion, agreeableness and conscientiousness) or because it is the cause of neighbouring items (life satisfaction influences neuroticism, extraversion, agreeableness and conscientiousness). Researchers interested in testing causal relationships should collect data that are informative about causality (e.g. twin data) and use SEM to test whether the data favour one causal theory over another.

We are also concerned about the suggestion of Cramer et al. (2012) that NA provides an alternative account of classic personality constructs such as extraversion and neuroticism. It is important to make clear that this alternative view challenges the core assumption of many personality theories that behaviour is influenced by personality dispositions. That is, whereas the conception of neuroticism as a personality trait assumes that neuroticism has causal force (Funder, 1991), the conceptualization of neuroticism as a personality component implies that it does not have causal force. The authors compare personality constructs such as neuroticism with the concept of a flock. The term *flock* in the expression *a flock of birds* does not refer to an independent entity that exists apart from the individual birds, and it makes no sense to attribute the gathering of birds to the causal effect of flocking (the birds are gathered in the same place because they are a flock of birds).

We prefer to compare neuroticism with the causal force of seasonal changes that make individual birds flock together

to fly south or north. A major limitation of NA is that it does not allow for unobserved causal forces to influence behaviour. Staying with the analogy, by mapping the relationships among birds, NA lacks a tool for modelling the influence of causal factors that influence all birds, such as the seasonal changes. Similarly, studies of intra-individual variation in behaviour over time cannot reveal the influence of personality traits that produce stable and consistent differences between individuals. One advantage of SEM is that it is possible to test causal models of within-person and between-person variances and to examine whether stable dispositions contribute to between-subject variance (Kenny & Zautra, 1995; Schimmack & Lucas, 2010).

We think that personality psychology has resurged as an important discipline in psychology because ample evidence demonstrates that human beings are not blank slates who are temporarily programmed by reinforcement schedules.

Rather, human beings have unique personalities that have persistent effects on their experiences, goals and behaviours. The main weakness of NA is that it lacks the capability to investigate the contribution of personality traits to human diversity in behaviour and experiences. As such, NA constrains personality researchers as much as EFA. The main advantage of SEM is that it does not force researchers to make assumptions that are dictated by the statistical model. Rather, personality researchers can use SEM to test competing causal theories. Most likely, observed behaviours are the product of a complex interaction between personality traits and environmental factors that are mediated by cognitions, motives and affective responses. A major challenge for psychologists remains the measurement of these mediating processes. At present, latent variable models of multimethod data provide the best opportunity to meet this challenge.