

Kinds *versus* continua: a review of psychometric approaches to uncover the structure of psychiatric constructs

D. Borsboom^{1*}, M. Rhemtulla¹, A. O. J. Cramer¹, H. L. J. van der Maas¹, M. Scheffer² and C. V. Dolan³

¹Department of Psychology, University of Amsterdam, Weesperplein 4, Amsterdam 1018 XA, The Netherlands

²Department of Aquatic Ecology and Water Quality Management, Wageningen University, 6700 AA Wageningen, The Netherlands

³Department of Biological Psychology, VU University, 1081 BT Amsterdam, The Netherlands

The question of whether psychopathology constructs are discrete kinds or continuous dimensions represents an important issue in clinical psychology and psychiatry. The present paper reviews psychometric modelling approaches that can be used to investigate this question through the application of statistical models. The relation between constructs and indicator variables in models with categorical and continuous latent variables is discussed, as are techniques specifically designed to address the distinction between latent categories as opposed to continua (taxometrics). In addition, we examine latent variable models that allow latent structures to have both continuous and categorical characteristics, such as factor mixture models and grade-of-membership models. Finally, we discuss recent alternative approaches based on network analysis and dynamical systems theory, which entail that the structure of constructs may be continuous for some individuals but categorical for others. Our evaluation of the psychometric literature shows that the kinds–continua distinction is considerably more subtle than is often presupposed in research; in particular, the hypotheses of kinds and continua are not mutually exclusive or exhaustive. We discuss opportunities to go beyond current research on the issue by using dynamical systems models, intra-individual time series and experimental manipulations.

Received 23 January 2015; Revised 3 September 2015; Accepted 3 September 2015; First published online 21 March 2016

Key words: Dynamical systems, latent variable models, network models, psychometrics, taxometrics.

Introduction

The question of whether mental disorders should be thought of as discrete categories or as continua represents an important issue in clinical psychology and psychiatry. The current setup of diagnostic systems such as the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5; American Psychiatric Association, 2013) and the 10th revision of the International Classification of Diseases (ICD-10; World Health Organization, 1992) typically adheres to a categorical model, in which discrete diagnoses are based on patterns of symptoms.

This approach is rooted in psychiatric traditions that go back to the work of Emil Kraepelin (e.g. see Kraepelin & Dierendorf, 1915), who laid the foundation for a psychiatric categorization system that views the science and diagnosis of mental disorders as a branch of medicine. In medicine, tracing observable symptoms (e.g. foggy eyesight, headaches) to

specific diseases (e.g. a tumour in the brain) plays a central role (Hyland, 2011). In fact, the successes of modern medicine are predicated on the insight that, in many cases, treatment should be directed at diseases (e.g. removing the tumour) rather than, for instance, at the observable symptoms themselves, because in medicine diseases function as root causes (Borsboom & Cramer, 2013). In this scheme of thinking, the decision of which treatment to assign to an individual depends on which disease that person has, rather than on the observable symptoms. Thus, the task of the physician is to identify diseases through diagnosis, after which an appropriate treatment can be selected. This idea functions as a template for health care systems around the world, and mental health care is no exception.

The current health care model assumes that psychiatric categorizations ‘carve nature at its joints’, as Plato puts it. However, such categorizations often involve apparently arbitrary conventions. For instance, while the DSM-5 diagnosis of major depression requires five or more symptoms to be present, it is unclear whether the resulting categorization is empirically superior to one that would require four or six symptoms for a diagnosis. If such categorizations do not have parallels in reality, for instance because they are

* Address for correspondence: D. Borsboom, Department of Psychology, University of Amsterdam, Weesperplein 4, Amsterdam 1018 XA, The Netherlands.
(Email: d.borsboom@uva.nl)