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In the absence of a gold standard

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Chapter 1

Introduction

There is no gold standard for measurement and diagnosis of psychopathology. An example of a gold standard is an answer sheet to a math exam. If the answers given by a respondent differ from the sheet, the respondent made mistakes. The reason we can treat this as a gold standard is that we have a strong believe in the correctness of mathematical proof. In psychiatry and psychopathology there is no such answer sheet and therefore no quick and easy way to ascertain whether the results of a test or a diagnosis are right. If discrepancies arise between different diagnostic procedures there is no final judgment to which both results can be compared to decide which one is true.

This does not imply that all measures are equally important, useful or valid, nor that the phenomena captured under the umbrella of psychopathology are not disturbing. I assume that the concept psychopathology refers to real problems that can be meaningfully communicated between people and influence the results obtained from measurement instruments. That being said, we are far away from a clear and certain understanding of what it is that we are measuring and communicating. In the papers presented in this thesis I aimed to confront a few of these disturbing uncertainties: (1) uncertainty about the latent structures underlying the covariances between measures of psychopathology, (2) uncertainty about the estimation of these covariances, (3) discrepancies between informants, and (4) the diagnostic concepts used in clinical practice. Admittedly, these four topics cannot be dealt with in full depth in a single thesis and the papers may elicit more questions than answers. However, I hope the thesis also shows the interrelatedness of these issues and their importance for applied psychological science. In the following I will shortly introduce each of these four topics.

Latent structures underlying psychopathology
Mental disorders cannot be observed, but diagnostic concepts are derived from ideas about (causal) associations between observations. Therefore diagnoses are sometimes referred to as hypothetical constructs (Strauss & Smith, 2009). Hypothetical emphasizes that we hypothesize that the terms refer to real attributes (Borsboom, Mellenbergh, & van Heerden, 2004), while the term construct refers to the fact that we make them ourselves while developing our sciences and practices. Some constructs are defined as dichotomies, which implies the hypothesis that the attribute is either present or not. Some constructs are defined as ordinal or continuous. In that case the attribute is hypothesized to be present in all people, albeit in different quantities. Finally, we can imagine mixtures in which a construct may only apply to subsets of people, but occur in different quantities within these people.

Psychological constructs are often developed on the basis of covariances between reported symptoms in a sample from the general population. The basic idea underlying this approach is that differences between individuals (inter-individual differences) result from the same underlying causal system. Differences in observed variables are assumed to be caused by differences in latent variables related to these underlying causal systems. For example, Watson, Wiese, Vaidya, & Tellegen (1999) hypothesize that observed differences in reported emotions are caused by differences in the functioning of two biological systems (Gray, 1990): the behavioral activation system (BAS) and behavior inhibition system (BIS). Individual differences in the functioning of these two systems would explain why persistently a two-dimensional structure of affect is found in factor-analytic studies of differences in self-reported emotion. To be sure, the above mentioned factor-analyses are only part of the argument for BIS and BAS. Latent factors derived from statistical analysis cannot be directly interpreted as indicators of existing phenomena, but are themselves in need of explanation.

With regard to psychopathology, the currently used Diagnostic Statistical Manual (4th ed.; American Psychiatric Association, 1994) provides diagnostic rules for research and clinical practice that allow users to apply diagnostic constructs to individuals. The validity of these constructs has been a continuous topic of debate among experts. Particularly, some have argued that there is no strong support for the dichotomous nature of many of the constructs and that the boundaries between constructs have not been shown to 'carve nature at its joints' (Lilienfeld, Waldman, & Israel, 1994; Waller, 2006). From a practical point of view it has been observed that many people meet criteria for multiple diagnoses, which is generally referred to as comorbidity. Given the problematic status of the validity of the dichotomous constructs, this comorbidity should not necessarily be interpreted as the presence of two diseases within the same individual (see Neale & Kendler, 1995). As an alternative some authors have used factor-analysis to study the latent structure underlying the DSM-IV comorbidity patterns (e.g. Vollebergh, et al., 2001). Also, authors have developed questionnaires independent of the DSM-IV system and used factor-analysis to investigate the structure of covariance between items on these questionnaires (e.g. Achenbach, 1991a; Achenbach & Edelbrock, 1978; Hartman, et al., 1999). Many DSM-IV and questionnaire based studies have resulted in a similar two-dimensional second-order latent variable model that has been found for children and adolescents (e.g. Lahey, et al., 2008), as well as adults (Krueger, Caspi, Moffitt, & Silva, 1998; Krueger, Chentsova-Dutton, Markon, Goldberg, & Ormel, 2003). The term 'second-order' refers to the fact that these two dimensions capture the covariance-structure of first-order subscales, which capture the covariance between symptoms (i.e. cognitions, emotions, behaviors). This model is generally referred to as the structure of Internalizing (INT) and Externalizing (EXT) psychopathology. In my view the single most important advantage of latent variable models is that they make a formal distinction between latent variables and observed questionnaire responses. This also implies that observed data can be used to compare alternative latent models, as will be done in chapter 2.

Second, they capture multiple psychological concepts within the same analytic model. Different psychological concepts (e.g. temperament and personality) have often been treated in separate literatures in which the overlap with other constructs (e.g. mental disorders) was neglected (Clark, 2005). This process can easily result in a multitude of ill-understood concepts that cause more confusion than clarification of the latent structure involved. Latent variable modeling of the covariance structure of multiple constructs of psychopathology can be used to investigate both common and specific features of these concepts. For example, the concept of a Broader Autism Phenotype (BAP) has received much attention in the literature on autism and has been conceptualized as a specific dimension or trait in the general population. In chapter 2 it is shown that the problems related to this dimension can be adequately studied within the framework of Internalizing and Externalizing psychopathology. This type of analysis is useful in order to evaluate how the BAP-concept relates to other concepts of psychopathology. A third advantage is that the variables in these models have been constructed as dimensions. As will be argued in chapter 3 there are important advantages to first develop a dimensional representation and only later introduce categories within this dimensional framework.

Discrepancies in the estimation of association between measures
Latent structures of psychopathology, like the model of internalizing and externalizing psychopathology, are generally derived from the covariance structure of reported symptoms in a sample. This means that it is assumed that the covariances are caused by individual differences in underlying psychopathology. However, estimations of associations between variables may also be influenced by several methodological biases. Specifically, sampling and measurement biases may influence the estimated association between different reported emotional and behavioral problems. In chapter 5 it will be tested to what extent these biases influence the estimated association between the internalizing and externalizing dimensions of psychopathology.

Discrepancies between informants
Symptoms of psychopathology are not directly observed by researchers or diagnosticians. Furthermore, one of the key criteria of DSM-IV for the application of any diagnosis is that the syndrome "… causes clinically significant distress or impairment in social, occupational, or other important areas of functioning" . That is, we need to know not only what behaviors and emotions occur in daily life, but also their impact on the person and the environment. The researcher is therefore dependent on informants, i.e. either self-report or reports of people related to the subject. Either through interviews or questionnaires informants are asked to report on the behaviors and emotions of the subject. This inevitably introduces informant-specific sources of variance in questionnaire responses. The often low correlations (e.g. r=.30; Achenbach, McConaughy, & Howell, 1987) between different informant reports suggest powerful informant-specific influences. If different informant reports would

reliably and validly measure one and the same attribute one would not expect such low correlations. For this reason researchers have attempted to distinguish between variance that is caused by characteristics of the subject and variance that is caused by the specific informants being used. In this thesis several of these models are applied and evaluated (chapter 4, 5, and 6).

It is important to realize that informant discrepancies do not necessarily indicate influences of methodological factors. In chapters 4 to 6 multiple reasons will be discussed why discrepancies may arise between informants. Of specific importance in chapter 4 are differences in the context in which an informant observes the subject and differences in the perspective by others and the self-perspective. These differences are not well captured by the term bias as they refer to actual observations rather than misrepresentation of observations. This does not mean that biases in observing and in responding to questionnaires are absent. In the chapters of this thesis both substantive and methodological reasons for the emergence of discrepancies will be discussed.

The creation of useful diagnostic language for clinical practice
Given the uncertain status of the latent models and hypothetical constructs of psychopathology one may wonder whether and how psychological problems can be meaningfully communicated among experts and between experts and non-experts. The important critiques that have accumulated over the years with regard to the dichotomies of DSM-IV suggest that this model may give a misleading impression of knowledge about psychiatric disorders. The manual itself makes it explicit that "in DSM-IV, there is no assumption that each category of mental disorder is a completely discrete entity with absolute boundaries dividing it from other disorders or from no mental disorder." (American Psychiatric Association, 1994) Nevertheless, the language that is developed by strictly applying the diagnostic rules is one of discrete disorders and 'comorbidity'. Furthermore, in many countries practices have developed that attach much status to DSM-IV dichotomous diagnoses which can influence treatment and reimbursement. The implication is that a gap may grow between the apparently solid categorical diagnostic language and the dimensional and uncertain knowledge about the latent structure to which this language should refer.

There is no quick and easy way to bridge this gap. As already mentioned, there is no gold standard to which we can refer for absolute measures and there is much uncertainty about the validity of diagnoses made in clinical practice. In communicating with clients in clinical practice it is nearly impossible to discuss all the subtle and less subtle arguments for and against certain diagnostic approaches. Nevertheless, I think it is crucial that a more nuanced and realistic diagnostic language be developed. In chapter 3 a perspective is developed on how to create useful diagnostic language on the basis of a dimensional framework of psychopathology. In the conclusion to this thesis I discuss whether and how uncertainties about measurement and discrepancies between informants can be incorporated into this diagnostic language.