

# Testing and adjusting translations of quasi-circumplex instruments

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## 1. Introduction

Circumplex models have been used to describe a wide range of psychological phenomena, including personality traits (?), values (?), affects (?), and identity formation modes (?). The circumplex model is a special case of a more general class of models, the circular models, where scales are arranged in a circular order. The circumplex model is a special case of the circular model where the scales are equally spaced and have equal communality.

## 2. Translating circumplex instruments

Typically, circumplex scales are measured via a series of questions in a survey instrument. These instruments are initially developed in one language and the validity and structure of the instrument is tested in that language. Often these instruments are directly translated into other languages to enable their use in other countries. However, the validity of the instrument in the new language is not guaranteed. Changes in the correlation structure can be caused by errors in the translation process, by semantic and linguistic differences between the translated scales even given a valid translation, and by a lack of generalisability of the circumplex instrument.

It is easy to see how errors in the translation process can lead to changes in the correlation structure. For example, if a question is mistranslated, then the responses to that question will not be correlated with the responses to the other questions in the instrument. Semantic and linguistic differences between the translated scales can also lead to changes in the correlation structure. For example, if a question is translated into a language where the concept does not exist or cannot be easily expressed, then the responses to that question will not be correlated with the responses to the other questions in the instrument. Finally, it may be that even if the original instrument is valid for e.g. the English-speaking population, it may not be valid for other populations due to cultural differences.

### 2.1. Goals of translating a circumplex instrument

Two approaches could be taken when attempting to translate a survey instrument. The first approach would attempt to achieve direct concurrence with the original instrument, where each scale is directly correlated with the corresponding scale from the original instrument. If the circumplex structure is identical between the two languages, then this approach would allow for the most direct comparison between the two languages. However, if the circumplex structure is not identical between the two languages, then this approach would lead to a loss of information. The second approach would attempt to achieve the same circumplex structure in the new language as in the original language. This approach would allow for the most direct comparison between the two languages.

### 2.2. Defining the circumplex model

Individual differences are conceptualized in models usually composed of a set of variables. Taking into account the relations between the variables, two kinds of models can be distinguished. In the first type, relations between variables are not strictly determined, while in the second type the relations between variables are precisely described based on theoretical reasoning. In the first type of models the necessary requirement is the differentiability between variables. As an example, take the Dark Triad (?). Narcissism, psychopathy, and Machiavellianism are expected to be related to each other (because they describe

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a common phenomenon), but not too much (because they focus on various aspects of the described phenomenon). Such models are usually tested through the means of factor analysis. In the second type of models, two requirements matter. In addition to the differentiability between variables, precisely determined relations between variables are expected. There are several subtypes of such models. In some of them the variables are claimed to be orthogonal, thus the correlations between variables are expected to be zero. This is, for example, the case for the Big Five (?). A special case of models within this type are the circular and circumplex models. In such models, there are several expectations regarding the relations between variables. Some variables are expected to be orthogonal (not correlated), some variables are expected to be negatively correlated and some variables are expected to be more correlated than others.

Correlation matrix structure:

Table 1: Theoretical pattern of the correlation matrix corresponding to a circumplex structure.  $\rho_1 > \rho_2 > \rho_3 > \rho_4$ .

	V1	V2	V3	V4	V5	V6	V7	V8
V1	1							
V2	$\rho_1$	1						
V3	$\rho_2$	$\rho_1$	1					
V4	$\rho_3$	$\rho_2$	$\rho_1$	1				
V5	$\rho_4$	$\rho_3$	$\rho_2$	$\rho_1$	1			
V6	$\rho_3$	$\rho_4$	$\rho_3$	$\rho_2$	$\rho_1$	1		
V7	$\rho_2$	$\rho_3$	$\rho_4$	$\rho_3$	$\rho_2$	$\rho_1$	1	
V8	$\rho_1$	$\rho_2$	$\rho_3$	$\rho_4$	$\rho_3$	$\rho_2$	$\rho_1$	1

The circumplex model can be defined through the terms of: 1) the possibility to locate variables differentiated in the model in the two-dimensional space with 2) equal spacing (i.e. same distance between variables within the model around circumplex) and 3) equal communality (i.e. same distance between variables from the middle of the circle) (?). On the basis of these criteria, one could differentiate four models, depicted on Fig. 1: a circular one (less restrictive Model 1), quasi-circumplex (Model 2 and 3), and circumplex (most restrictive Model 4).

In Model 1 all variables have assigned a circular order, but they are not equally spaced or have equal communality. Such models are called circular.

This circular arrangement of the variables can be tested using a method proposed by Tracey, Rounds, and colleagues (?).

In line with the procedure taken in ?, we begin by confirming the circular ordering of the circumplex scales. This test, developed by Tracey, Rounds, and colleagues (?), the test of the circular order model involves comparing the obtained order relations for a set of scales against their hypothesized order given a certain circular model. The index used for this test is Hubert and Arabie's (?) correspondence index (CI).

(from ?) This provides a descriptive measure of the extent to which the model's order predictions are confirmed in a given sample matrix and is equal to the proportion of predictions met minus the proportion violated. It can thus range from 1.0 (all predictions met) to -1.0 (all predictions violated). Following Tracey et al. (Tracey, 1997; Tracey & Rounds, 1993, 1997; Tracey & Schneider, 1995), we also conducted a randomization test on the hypothesized order relations (Hubert & Arabie, 1987; Rounds et al., 1992). This test provides an exact probability for obtaining the observed model fit in relation to all possible permutations of the matrix.

Two models fulfill one of the requirements mentioned above but not another, that is: variables in Model 2 are located with equal spacing but unequal communalities, while variables in Model 3 are located with unequal spacing but equal communalities. These models are referred to as quasi-circumplex. Finally, there is Model 4, where both spacing and communalities are equal. This model is referred to as circumplex.

### 2.3. Locating external variables within circumplex models

Circumplex models allow for the testing of complex hypotheses not only about relations between circumplex variables but also about relations with external variables. Therefore, the analyses include two parts. The first one is testing the internal structure of the model in order to confirm its circumplex nature. The second one is the analysis of relations between external variables with variables differentiated in the circumplex or, in other words, **these variables could be located within the space defined by the circumplex**. This part is especially interesting because locating variables allows hypotheses to be formulated regarding all circumplex variables simultaneously. For example, some of the relations between a particular variable and all variables from a circumplex model would be expected to be strong, some weak, some negative, and some positive. The circumplex model precisely predicts all of them.

Circumplex models usually describe a given area of psychological functioning in a comprehensive

way. For example, the assumption of the interpersonal circumplex (?) is that it describes the whole range of interpersonal behaviours. The same concerns other circumplex and circular models like values (?), affects (?) or identity formation modes (?), to mention just a few. Thus, locating an external variable within the space of a circumplex enables interpretation of this variable in the context of the comprehensive description of a given psychological area of interest. A special case within circumplex models that enables such an interpretation, albeit exceptionally far reaching, is the Circumplex of Personality Metatraits (??).

#### 2.4. A special case of circumplex models - the circumplex of personality metatraits

The Circumplex of Personality Metatraits (CPM, illustrated on Fig. 2) was based on the Five Factor Model of personality (?), although it offers a more parsimonious description of personality as the five-dimensional space is transformed into a two-dimensional one. Turning from the research on the Five Factor Model metatraits of Alpha/Stability and Beta/Plasticity (?) in a circumplex model solved controversies around the General Factor of Personality (Gamma/Integration in CPM; (?)) as it is no longer hypothesized to be located at the top of the hierarchy of personality but at the same level of the circumplex structure (?). Moreover, another metatrait (labelled Delta/Restraint), as a result of high/low Plasticity versus low/high Stability, was distinguished to fully cover the conceptual space of the circumplex. Metatraits within CPM are unipolar dimensions, that is, each metatrait introduces qualitatively distinct psychological content (as in supplementary materials). Therefore, there are eight metatraits within the model: Alpha, Beta, Gamma, and Delta, with a positive pole labeled as Plus and a negative pole as Minus. All of the metatraits within CPM have equal communalities and are equally spaced by 45 degrees.

CPM has two advantages over the other models (?): 1) it provides the possibility to grasp to comprehensive personality underpinnings for various psychological constructs in terms of the broadest personality dimensions and 2) it creates the opportunity to capture, clarify, and systematize the relationships between a very broad range of various psychological constructs. These advantages of the CPM have already been utilized within the literature to clarify relations between a range of constructs, including personality disorders (?), and more specifically, narcissism (?), which will

serve as an example for the tutorial purposes of the current paper.

#### 2.5. Structure of narcissistic personality within the circumplex of personality metatraits

Within the literature, it is widely agreed that narcissism has a three-factorial structure composed of: grandiosity (i.e. exaggerated self-views), antagonism (i.e. superiority and lack of respect towards others) and vulnerability (i.e. hypersensitivity and reactivity; (?)). One of the theoretical models, that is, the Narcissism Spectrum Model (NSM; (?)), describes the structure of narcissistic personality in terms of angles. Grandiosity and vulnerability are both located at an approximate angle of 45 degrees from antagonism (labeled as self-importance in NSM), which is located at the core of the narcissistic personality. [...]

### 3. A three step procedure for the analysis of circumplex models

We propose a three-step procedure to analyze the circumplex models.