Unit 2 *Theoretical and Methodological Issues*
Subunit 2 *Methodological Issues in Psychology and Culture*

Article 5

8-1-2003

Cross-Cultural Meta-Analyses

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Abstract

In the enormous collection of cross-cultural data that have been published during the last few decades it is difficult to perceive patterns. There is a clear need for systematizing the vast amount of cross-cultural studies and for developing models that explain cross-cultural differences in psychology. Two methods of cross-cultural meta-analysis can be distinguished. First, the instrument-based method of comparing data for one instrument across countries is suitable for instruments which have been administered in many countries. Second, a domain-based meta-analysis used a thematic domain from which culture-comparative studies are sampled instead of one specific instrument or method.

INTRODUCTION

Culture has become an important topic of psychological research, as can be derived from the rapidly increasing number of articles published on cross-cultural comparisons (see van de Vijver & Lonner, 1995). Most of these studies describe cross-cultural similarities and differences in psychological phenomena, usually comparing two countries on a single variable (van de Vijver & Leung, 1997). Cross-cultural studies may vary in a number of ways (see http://scholarworks.gvsu.edu/orpc/vol2/iss2/2/). For example, one study may report mainly similarities in a simple cognitive performance task (such as a digit-span-forward memory task) between Australia and Argentina, while another study may report relatively large differences in a complex cognitive task (such as a spatial orientation task) between Bulgaria and Belgium. Why do different studies report such different results? In order to answer this central question, many factors have to be taken into account. The specific instrument that was used to measure cognitive performance may differ, as well as the sample sizes and the composition of the samples (such as the male/female ratio). In addition, the countries themselves may differ in a number of ways. All these factors may have an effect on the results that are found. Meta-analyses of single and multiple instruments (e.g., Hedges & Olkin, 1985; Hunter & Schmidt, 1990; Rosenthal, 1984) provide ways to systematically combine cross-cultural data in order to find variables explaining cross-cultural variation.

Meta-Analysis: The Basics

Meta-analysis provides a way to combine findings from empirical studies using strict methodological requirements. Cross-cultural psychology can benefit from meta-analysis in two ways; (1) it summarizes the outcomes of many (cross-cultural) studies on a particular topic, and (2) it identifies variables explaining cross-cultural differences. Glass (1976) defined meta-analysis as: "the statistical analysis of a large collection of analysis results from individual studies for the purpose of integrating the findings" (p. 3). In order to perform a meta-analysis, research reports in the literature are searched in a systematic way and coded on a number of sample-related and study-related variables, as well as on statistics for calculating effect sizes. An ***effect size*** is a standardized measure of the relationship between an independent variable (such as gender, culture, or treatment) and a dependent variable (such as scores on a self-report questionnaire or performance on a test) in a specific meta-analysis (see Box 1 for an example of an effect size calculation). An overall estimate of the strength of the relationship between independent and dependent variables results from combining effect sizes from all included studies. Also, coded sample and study characteristics are used to identify ***moderators***. These are variables that influence the relationship between the independent and dependent variables (Hunter & Schmidt, 1990). Moderator variables explain part of the variance in the effect sizes. For example, in the comparison of results from the above-mentioned Australia/Argentina and Bulgaria/Belgium cognition studies, the complexity of the task may be moderator variable

(i.e., simple or complex), as well as the cultural distance between the countries in the comparison.

Box 1

Example of effect size calculation

A meta-analysis is aimed at the relationship between gender and neuroticism. One of the selected studies reports the following data on the Neuroticism scale of the Eysenck Personality Questionnaire:
Women (N = 97), mean Neuroticism score 11.35 (SD = 4.04)
Men (N = 101), mean Neuroticism score 8.29 (SD = 5.39)

(Gomà-I-Freixanet, 1997)

The effect size for the difference in neuroticism between the genders (Cohen's g, Cohen, 1977) is defined as
$d = (m_1 - m_2) / s_p$, where m_1 is the mean of group 1, m_2 is the mean of group 2, and s_p is the pooled sample standard deviation:

$$s_p = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{(n_1 + n_2 - 2)}}$$, where n_1 is the sample size of group 1, n_2 is the sample size

of group 2, s^2_1 is the variance of group 1, and s^2_2 is the variance of group 2.

In our example, with the women as group 1 and the men as group 2

$$s_p = \sqrt{\frac{(97 - 1)(4.04)^2 + (101 - 1)(5.39)^2}{(97 + 101 - 2)}} = 4.78$$

$d = (11.35 - 8.29) / 4.78 = .64$

Cohen (1992) considers effect sizes smaller than .20 to be small, and effect sizes larger than .80 to be large; thus, this is a moderate effect.

Meta-Analysis and Culture

Meta-analysis can make three contributions to theoretical advancement in cross-cultural psychology. First, meta-analysis provides a method to summarize a wide array of previous results in a systematic way. Second, in reporting results, many cross-cultural studies focus on differences rather than similarities between cultures, although such differences may show poor replicability. Meta-analysis provides a method to estimate the actual size of cross-cultural differences because it allows for the correction of the influence of sampling fluctuations and other artifacts. Third, meta-analysis allows researchers to examine models and theories about cross-cultural differences by using moderator variables to explain cross-cultural variation.

In cross-cultural meta-analyses an extra level of analysis is introduced. Regular meta-analyses use sample-level variables (sample characteristics such as age and gender) and study-level variables (study characteristics such as the type of the instrument) to explain different results between studies. In cross-cultural meta-analyses the level of the cultural population also has to be dealt with, apart from the usual sample level and study

level. This implies the coding of extra variables at the cultural level and introduces an extra category of moderator variables. As a consequence, moderator variables in cross-cultural meta-analyses can be either *internal* or *external*. Internal moderators are variables that are related to the study, such as composition of the sample, the instrument that was used, and the theoretical background of the study. These variables are coded along with the studies. External moderators are specific for cross-cultural meta-analyses. They are country-level variables that are added at a later stage (such as Gross National Product of countries, or a country-level scores on individualism). The introduction of an extra level in cross-cultural meta-analyses means that more studies than usual should be included in order to acquire stable estimates and explain part of the variance.

Before estimating the size of cross-cultural differences in a meta-analysis, the influence of statistical artifacts and method-related factors should be ruled out (see van Hemert, Poortinga, & van de Vijver, 2007). De Leeuw and Hox (2002) mention three steps in the analysis of cross-national data. First, the size of the differences between countries is estimated. Second, it is investigated whether differences between countries are attributable to methodological differences in the procedures. Finally, explanatory variables at country level are examined. Thus, variance between countries consists of (1) sampling variance (a non-systematic artifact in meta-analyses that depends mainly on sample size of the studies and can have a substantial effect), (2) variance due to methodological artifacts, and (3) systematic and substantive variance. A study by Lipsey (1997) is interesting in this context. He described a meta-analysis combining about 300 meta-analyses of psychological, behavioral, and educational interventions. In all meta-analyses, he estimated the variance among effect sizes that was attributable to the three above-mentioned sources of variance and residual variance as an additional source, and pooled these estimates across all 300 analyses. Each of the four sources of variance, i.e., sampling error variance, method variance, substantive variance (related to the target variable), and residual variance, explained about one-fourth of the total variance. Similar figures were found in a meta-analysis of cross-cultural emotion studies and a cross-cultural meta-analysis across several domains of psychology (van Hemert, 2011; van Hemert et al., 2007). To summarize, a cross-cultural meta-analysis should set out to examine the amount of variance explained by statistical artifacts (such as sampling error), method-related factors (such as the type of instrument that was used) and substantive factors (related to the dependent measure and culture).

Instrument-Based and Domain-Based Approaches

Most cross-cultural meta-analyses collect data on a single psychological instrument or research method in as many countries as possible. Effect sizes based on these data are compared between countries. For example, Khaleque and Rohner (2002) compared reliability coefficients for measures of perceived parental acceptance-rejection and psychological adjustment. They divided 10 different countries in four regions and compared scores for these regions. Bond and Smith (1996) collected 133 conformity studies using Asch's line judgment task, originating from 17 different countries. The impact

of a number of study-related and country-related moderators on conformity was assessed. It was found that cultural-level variables such as individualism scores and Schwartz's values were significantly related to conformity effect sizes. In another study, van Ijzendoorn and Kroonenberg (1988) meta-analyzed 32 samples from 8 different countries with respect to Ainsworth's Strange Situation, i.e., an experiment measuring infant-mother attachment. They found that differences were larger within countries than between countries, indicating that variables other than culture-related factors are important. Born, Bleichrodt, and van der Flier (1987) compared effect sizes of various intelligence measures for five clusters of cultures. In total, 189 studies on either one of nine Thurstone-like factors or a General Intelligence factor were included. Finally, Strube (1981) meta-analyzed competitiveness studies from 15 different cultural groups and found that overall boys are more competitive than girls.

This ***instrument-based*** method is in line with the way traditional meta-analyses are performed. Yet, traditional meta-analytic approaches do not address problems that are typically encountered in cross-cultural applications (e.g., the introduction of country as a level of analysis). Also, only few instruments have been administered in a sufficient number of countries to allow for adequate cross-cultural comparisons. Since "culture" is a broad and diffuse concept, encompassing many aspects that may be relevant for the topic studied, one needs data from several countries to be able to adequately explain cross-cultural differences. Therefore, the instrument-based meta-analysis is not suitable for describing patterns of differences and similarities in culture-behavior relationships across different areas of behavior.

A second type of meta-analysis deals with these problems by broadening its focus to a domain of studies. Instead of one specific instrument or method, a thematic domain is outlined from which culture-comparative studies are sampled. For example, van de Vijver (1997) collected 197 cross-cultural studies reporting a variety of cognitive measures. Sample characteristics, aspects of the study and country-level indicators were used to explain cross-cultural differences. In such a ***domain-based*** meta-analysis the dependent measure is the difference on a psychological variable between two cultural groups; effect sizes are based on pairwise comparisons of cultural groups or countries. Because of the diversity of studies in a domain-based meta-analysis, the focus is on explaining parts of the variance in terms of various moderators, rather than examining only the absolute size of the differences. The advantage of this approach is that a broader range of variables can be included in the meta-analysis, as well as a broader range of countries. This makes it possible to explain cross-cultural differences and outline broader patterns of cross-cultural similarities and differences.

Another example of a domain-based meta-analysis in cross-cultural psychology was performed by van Hemert et al. (2007). They collected 190 studies comparing two or more cultural groups or countries on an emotion variable, ranging from happiness self-reports to recognition rates of facial anger expressions. Results indicated that correcting for statistical artifacts reduced the observed cross-cultural effect sizes considerably. It was concluded that both method-related factors (14.8% of variance explained) and substantive factors (13.3% of variance explained) underlie cross-cultural differences. In an even

broader meta-analysis, van Hemert (2011) combined 219 culture-comparative studies from five domains in psychology: psychophysiology/ psychophysics, perception, cognition, personality, and social behavior. Cultural (13.2% of variance explained), methodological (15.2% of variance explained), and statistical factors (9.5% of variance explained) played together in explaining cross-cultural variance in psychological studies.

Characteristics of both types of meta-analysis are summarized in Table 1. As the domain-based meta-analysis is necessarily broader and less detailed than the instrument-based one, it allows for broader generalizations. On the other hand, the instrument-based meta-analysis is more suitable for the testing of specific hypotheses. Because of this, an instrument-based meta-analysis is likely to use fewer moderator variables than a domain-based meta-analysis.

The role of "culture" differs in the two types of meta-analysis. In instrument-based meta-analyses, the effect size is a measure of the relationship between an independent and a dependent variable, for example between gender and leadership styles. These effect sizes are compared among cultures. For example, Watkins (2001) conducted a meta-analysis on the relationship of approaches to learning (such as learning styles) with variables such as self-concept, locus of control, learning environment, and academic grades, in which he compared correlations for 15 different western and non-western countries. Here, culture is used as a moderator variable with the same status as other moderator variables. In contrast, domain-based meta-analyses use effect sizes based on a comparison of two countries on the dependent variable. For example, in their meta-analysis on culture and emotion, van Hemert et al. (2007) used effect sizes indicating the standardized difference between two countries or cultural groups on an emotion variable. Here, culture is the independent variable in the effect size, explaining differences in the dependent variable.

Table 1

Characteristics of Cross-Cultural Instrument-Based and Domain-Based Meta-Analyses

Instrument-based meta-analyses	Domain-based meta-analyses
• Examines one instrument or method	• Examines one thematic domain
• Focused	• Broad
• Focus on size of differences	• Focus on interpretation of differences, i.e., identification of moderators
• Allows for specific testing of hypotheses	• Allows for generalizations of culture-behavior relationships
• Few moderators	• Many moderators
• Culture is moderator variable	• Culture is independent variable
• Effect sizes for different cultures compared	• Cultural comparison is embedded in effect size
• Effect size involves the relation between independent and dependent variable in one country	• Effect size involves difference in dependent measure in two countries (pairwise comparisons)
• Possible to examine equivalence	• Not possible to examine equivalence

A final difference between the two types of meta-analysis concerns the possibility of examining equivalence of concepts at different levels of analysis, such as the individual and the country level. This means that the meaning of a concept is compared at the level of individuals and countries. Instrument-based meta-analyses allow for this kind of testing but domain-based meta-analyses usually do not. For instance, van Hemert, van de Vijver, Poortinga, and Georgas (2002) examined the equivalence of the scales of the Eysenck Personality Questionnaire at individual level and country level across 24 countries. It was found that neuroticism and extraversion have the same meaning at individual and country level, but psychoticism and social desirability do not.

Conclusions

Meta-analysis is a useful method in cross-cultural psychology for combining results and developing theories. Over the past decades sufficient studies have been performed by cross-cultural researchers to allow for cross-cultural meta-analyses, both specific (instrument-based) and global (domain-based). However, applying meta-analytic methods to cross-cultural data introduces some specific issues. Before explaining variance in terms of cultural factors, researchers should take care to explain variance by statistical artifacts (related to sample size), method-related variables (such as the type of instrument), and substantive factors that are unrelated to culture (related to the dependent measure). As a result, cross-cultural meta-analyses necessarily contain more moderators than regular meta-analyses and thus more studies are needed. In the future, more advanced methods of cross-cultural instrument-based and domain-based meta-analyses are needed as well as combinations of these two approaches, since both methods proved very promising in the exploration of explanations for cross-cultural differences in psychology.

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Suggested Readings

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Related websites

http://www.psych.purdue.edu/~jamie/statistics_explained/meta.ps for elaborate and useful information on meta-analysis
http://ericae.net/aesearch.htm for varied information on meta-analysis and interesting links
http://www.oecd.org for country-level indicators
http://www.un.org/ for country-level indicators
http://www.lib.umich.edu/government-documents-center for an overview of statistical resources on the web.

About the Author

Dianne van Hemert is a postdoctoral researcher of cross-cultural psychology at Tilburg University, The Netherlands. In 2002 she finished her PhD thesis from the same university. The study examined patterns of cross-cultural differences by means of four cross-cultural meta-analyses in the areas of personality, emotions, and other domains in psychology. Her interests include meta-analytic methods in cross-cultural psychology and relations between individual-level and country-level characteristics. E-mail address: d.a.vanhemert@uvt.nl
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Questions for Discussion

1. What are the advantages of meta-analysis to a single study? What are the disadvantages?
2. Make a list of possible moderator variables to be coded from studies in a cross-cultural meta-analysis of the relation between personality traits and depression. Make a distinction between method-related variables and substantive variables.

3. A common criticism of meta-analysis is the inclusion of studies that are not well designed or have methodological faults. However, it is possible to code the quality of the studies and use this quality variable as a moderator variable in your analyses. Name a few variables to be coded from studies that indicate the quality of the studies.

4. Take a topic in your area of expertise. How would you design an instrument-based and a domain-based meta-analysis on this topic? What study-related variables and country-level indicators would you use?