Methodological Issues in the Meta-Evaluation of Correctional Treatment

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Introduction

The great social importance of criminality has generated a research field named *crime treatment evaluation*. Several decades ago, it was intended to clarify whether the rehabilitation of offenders was possible. Currently, the number of empirical evaluations on correctional programs is so huge that is practically impossible to revise and integrate all the literature without using systematic and quantitative procedures of research synthesis. This is precisely the objective of meta-analysis: to integrate quantitatively the results of empirical studies on a topic (Cooper, 1989; Cooper & Hedges, 1994; Glass et al., 1981; Hedges & Olkin, 1985; Hunter & Schmidt, 1990; Rosenthal, 1991; Sánchez-Meca & Ato, 1989; Wachter & Straff, 1990; Wolf, 1986).

Meta-analytic studies, usually performed to study the outcome of intervention programs, start from a basically descriptive position: to determine the mean effect of a program and the possible influence of certain moderator variables on the results of such program. But meta-analyses can provide a more explanatory than merely descriptive approach, can and should propose explanatory models of why a program is effective and under what conditions it works better, and also prove the possible influence of methodological factors in the results of the primary studies. Thus, it is necessary to apply statistical models adapted to meta-analysis focusing on explanation rather than description.

Stemming from ideas recently proposed by authors such as Lipsey (1992a, 1992b, 1992c, 1994; Durlak & Lipsey, 1991), Cook, et al., (1992), and Rubin (1990, 1992), the advantages of meta-analysis to detect the influence of methodological aspects on correctional program evaluation are presented. First, a brief description of meta-analysis is presented; second, a conceptual framework that permits us to classify and identify the susceptible methodological variables of study in a meta-analysis is explained; several examples from existing meta-analyses at present on correctional evaluation follow; and finally, a meta-analysis model is outlined in which the effects of methodological variables can be controlled and the results of the program evaluations can be explained.

Meta-analysis: conceptualisation

To carry out a meta-analysis the result of each study is measured in a standard way through some index of the magnitude of the effect (for example, the standardised mean difference, the Pearson correlation coefficient, the *Phi* coefficient, the odds ratio, etc.) and the most relevant study characteristics are coded aiming at ascertaining their possible moderating influence on the effect magnitude. In this way, the review process of a topic turns into an investigation in which the analysis unit is the empirical study, the dependent variable is the effect magnitude of each study, and the independent variables are the characteristics coded in the studies. From this perspective, the meta-analysis applied to program evaluation allows one to: (a) obtain a global index of the program outcome; (b) test whether the results of the studies are homogeneous vis-a-vis the global index, and, otherwise, (c) search for those study characteristics that could explain the heterogeneity of the results.

Since Glass in 1976 coined this term, there have been countless quantitative syntheses in the behavioural and social sciences, and, particularly, in the evaluation of psychosocial intervention programs (Glass, 1976; Glass et al., 1981). The field of correctional program evaluation has not been detached from the arrival of this new research methodology. In fact, since the 1980s, several meta-analytic studies on this topic have been published, which point out the existence of certain positive results, in general terms, contradicting the conclusions reached by previous traditional reviews (Andrews et al., 1990; Garrett, 1985; Gensheimer et al., 1986; Gottschalk et al., 1987a, 1987b; Lipsey, 1992a; Lösel & Köferl, 1989; Mayer et al., 1986; Whitehead & Lab, 1989).

Meta-Analysis as a Meta-Evaluation Tool

Although determining the global efficiency of an intervention program is a suggestive issue, the advantages of meta-analysis go further. Thanks to meta-analysis it is possible to determine *the state of the art* of any research field, that is to say, it is possible to study how it is being investigated, what methodological deficiencies the primary studies contain, and how they can be eliminated. In this way, meta-analysis is a powerful tool for the meta-evaluation of intervention programs.

In order for a meta-analysis to carry out this function, meta-analysts as well as meta-analytic study consumers should be aware of the fact that the results of a program evaluation can be affected not only by substantive factors such as type of treatment, subject characteristics or setting, but also by methodological factors and experimental procedure, such as subject assignment type, design type, or attrition. Thus, following Light and Pillemer (1984), and most recently Rubin (1990, 1992), it is possible to formulate a simple functional model, in which

the result of an intervention program evaluation is a function of substantive and methodological aspects:

$$Y = f(X, M),$$

where Y is the result of the empirical evaluation; and X and M represent substantive and methodological characteristics, respectively.

Starting from this simple model, meta-analysis, through the integration of the studies, can determine the influence of substantive as well as methodological variables on the effectiveness of a given program.

A conceptual framework of study characteristics

Thus, it is necessary to elaborate a conceptual framework that permits us to classify the study characteristics attending to the distinction between methodological and substantive variables. The proposed framework is shown in Table 1.

Following Lipsey (1994), together with the methodological and substantive characteristics, a new variable type that may be referred to as extrinsic variables is included.

(a) *Substantive characteristics* refer to the nature of the treatment provided (e.g., treatment modality, underlying theoretical model, treatment duration, number of sessions, etc.), the characteristics of the subjects included in the study (e.g., gender, age, offence type, cultural status, etc.), or even aspects related to the setting in which the treatment has been implemented (e.g., geographical, cultural, temporal, or political setting). Usually, substantive characteristics are considered the most important in meta-analyses; therefore meta-analyses of correctional evaluation have been centred on the study of their influence on the effect magnitude of the evaluations.

(b) *Methodological characteristics* include aspects related to the design and the research procedures used to evaluate the program such as, design type (experimental, quasi-experimental, pre-experimental), subject assignment type to the groups, control group type (not treated *versus* placebo), attrition, design quality, quality and nature of outcome measures, sample size, etc. Of course, not all these variables will necessarily influence the results of a program evaluation, but a central aspect in any meta-analysis should be to test their possible moderator effects.

(c) Finally, following Lipsey (1994), Table 1 includes a third variable category called *extrinsic characteristics*; they are not directly related to program implementation and in previous classifications were included within the category of methodological variables. Although extrinsic variables would not influence the results of a program evaluation, it has been shown that these variables are correlated with the effect magnitude in many meta-analyses. Of particular mention are the publication source (published *versus* unpublished studies), researcher

characteristics (e.g., gender, disciplinary affiliation, etc.), nature of research sponsorship, and accuracy of empirical studies to present any relevant information about the measures used, experimental procedure, treatment features, etc.

Table 1: A Conceptual Framework to Characteristics of Studies

Methodological characteristics	Nature of treatment provided	Type of treatment Dosage / Intensity Duration Therapist experience
	Characteristics of subjects	Age Sex Offence type
	Setting / context	Cultural Geographic Temporal
	Design type	Experimental Non-equivalent groups Pretest-postest Normative group Other
	Data analysis (statistical tests) Sample size (n) Attrition (%) Design quality Quality of measures Assignment (random vs. non-random) Pretest measures (present vs. absent)	
Extrinsic characteristics	Characteristics of the researcher/s	Gender Affiliation Training
	Research circumstances	Nature of study Sponsorship
	Form of publication	Journal article Chapter or book Thesis Unpublished manuscript Other
	Accuracy of reporting (details of procedures, method, measures, treatments and results)	

The influence of methodological characteristics in correctional evaluation

In the field of psychosocial program evaluation and especially in crime treatment evaluation, it is very difficult to apply experimental designs whose principal requirement is the random assignment of the subjects to the groups. On the contrary, as Lipsey reported (1988; Lipsey et al., 1985), the evaluation of intervention programs is most represented by the use of quasi-experimental methodology, particularly designs with non-equivalent control groups and, less frequently, pretest-postest designs with one group. From Cook and Campbell's research validity framework (1979), when the intention is to obtain an index of treatment effectiveness, the main problem in the quasi-experimental designs is the differential selection of the subjects that receive the program compared to the subjects that do not receive it. If at the beginning of the program the two groups are non-equivalent in the relevant variables, then the postest comparison of the two groups can produce a biased estimate of the effect size. But the use of an experimental design in correctional evaluation does not assure us that the effect size estimate will not be biased. As Wortman (1992, 1994) emphasised, experimental designs present the problem of attrition; thus, two groups of subjects formed through random assignment can become non-equivalent at the postest due to the differential loss of subjects in both groups.

Consequently, to obtain an unbiased estimate of the effect size will require controlling for the possible research validity threats, whatever the research design. This is possible to accomplish in a meta-analysis, provided that the relevant methodological features of the studies can be codified. Although meta-analyses on correctional evaluation mainly have been centred in substantive variables, they have analysed the influence of several methodological variables too. Examples to illustrate it are presented.

Table 2a: Average Effect Size by Outcome Measure

Outcome	*ES*	*N*
Recidivism	0.13	34
Institutional adjustment	0.41	41
Psychological adjustment	0.52	60
Community adjustment	0.63	12
Academic improvement	0.78	30
Vocational adjustment	0.001	5
Other	0.71	11

ES: Mean effect size (standardised mean difference)
N: Number of studies
(Adapted from Garrett, 1985, p. 299)

Table 2b: Average Effect Size by Type Measure

Type of measure	*ES*	*N*
Behavioural observation	0.57	58
Peer-rating sociometric	0.37	19
Expert rating	0.98	8
Normed measures	0.29	51
Unnormed measures	0.51	74
Achievement-intellectual test	0.59	20
Cognitive-performance measure	0.67	78
Objective performance measure	0.37	4

ES: Mean effect size (standardised mean difference)
N: Number of studies
(Adapted from Durlak, 1991, p. 208)

First, meta-analytic studies on correctional evaluation show that different outcome measures produce different effect sizes (e.g., recidivism, psychological adjustment, interpersonal adjustment, occupational adjustment, etc.). Table 2a shows the results of the meta-analysis of Garrett (1985) on the treatment programs for adjudicated offenders in residential / institutional settings. As a general rule, the recidivism measures tend to have the lowest effect sizes. Another example is shown in Table 2b from Durlak et al., (1991) on the effectiveness of cognitive behavioural therapy with dysfunctional children. In this case the effect sizes varies as a function of the type of measure.

Second, it seems that evaluation studies with higher sample sizes present the lowest effect sizes. In their meta-analysis review on the efficacy of psychological, educational, and behavioural treatment, Lipsey and Wilson (1993) showed similar results. Table 3 shows how the mean effectiveness diminishes when sample size increases. Probably this is due to the interaction of this variable with other methodological and substantive variables (for example, type of treatment, setting). Also it could be explained by the greater care and control when performing evaluations with reduced groups.

Table 3: Comparison of Effect Sizes Based on Studies with Different Sized Samples

Sample size	*ES*	*N*
N less than 50	0.58	39
N 51 to 100	0.52	39
N more than 100	0.35	39

ES: Mean effect size (standardised mean difference)
N: Number of meta-analyses
(Adapted from Lipsey and Wilson, 1993, p. 1195)

Third, it is a clearly demonstrated fact that pretest-postest designs overestimate effect size in comparison with between-group designs. For example, in their meta-analysis on the efficacy of community-based interventions for juvenile offenders Gottschalk et al., (1987a) showed how pretest-postest designs present a mean effect size higher than between-group designs. Lipsey and Wilson (1993) obtained similar results (see Table 4). This could be explained by the influence of some validity threats in pretest-postest designs such as maturation. Also it could be put down to some artefact in the calculation of the indices of the effect size because of the correlational nature of the data.

Table 4: Average Effect Sizes as a Function of Design Type

	Design type			
	E/C		*Pre-post*	
Source	*ES*	*N*	*ES*	*N*
Gottschalk et al., (1987a)	0.36	66	0.93	35
Lipsey and Wilson (1993)	0.47	45	0.76	45

ES: Mean effect size (standardised mean difference)
N: Number of meta-analyses or studies
E/C: Experimental versus Control design
Pre-post: Pretest-Postest design

Fourth, follow-up time is a relevant variable in program evaluation. In this way, Lösel and Köferl (1989), and Lipsey (1992a, 1992b, 1992c) have shown lower effect sizes with longer follow-up times.

Subject assignment to the groups has been considered essential in research design, distinguishing basically between random (experimental designs) *versus* non-random assignment (quasi-experimental designs). Several meta-analyses of correctional evaluations have approached this factor and observed ambiguous evidence. The meta-analyses of Andrews et al., (1990), Whitehead and Lab (1989) and Lipsey (1992a, 1992b, 1992c), as well as the meta-analysis review of Lipsey and Wilson (1993), have not found a clear influence of subject assignment type on effect magnitude. Nevertheless, in the meta-analysis on community-based interventions, Gottschalk et al., (1987a) found higher effectiveness in the studies with random than those with non-random assignment.

Finally, the design quality integrates, somehow, the aforementioned aspects. But there are no clear results in meta-analyses on correctional evaluation. Thus, Garrett (1985) has found that the less rigorous studies present the higher effect sizes, and vice versa; while Andrews *et al.* (1990) and Lipsey and Wilson (1993) have not found relevant differences as a function of design quality (see Table 5).

Table 5: Average Effect Sizes as a Function of Methodological Quality

	Methodological quality			
	High		*Low*	
Source	*ES*	*N*	*ES*	*N*
Gottschalk et al., (1987a)	0.36	66	0.93	35
Lipsey and Wilson (1993)	0.47	45	0.76	45

ES: Mean effect size (standardised mean difference)
N: Number of meta-analyses or studies

The situation is aggravated since the existence of interrelationships between some methodological and substantive characteristics is very common. In the meta-analysis on institutional treatment of juvenile delinquents, Garrett (1985) includes a clear example shown in Table 6. Taking their results globally, behavioural treatment seems to be more effective than psychodynamic and life skills treatments. However, when the most rigorous studies are selected, no differences among behavioural therapy and life skills are observed. Furthermore, within those presenting recidivism outcomes, only life skills treatment seems to be effective. This is a clear example of interaction among design quality, treatment type, and outcome measure.

Table 6: Average Effect Sizes for Different Delinquency Treatments in Relation to Study Design and Outcome Measure

	Overall		Rigorous designs only		Rigorous designs, recidivism outcome only	
Treatment category	*ES*	*N*	*ES*	*N*	*ES*	*N*
Psychodynamic	.17	164	.17	141	-.01	84
Behavioural	.63	149	.30	62	-.08	17
Life skills	.31	57	.32	35	.30	19

ES: Mean effect size (standardised mean difference)
N: Number of studies
(adapted form Garrett, 1985)

Consequently we agree that the effect of methodological variables should be examined before studying the influence of substantive variables in a meta-analysis (Hedges, Shymansky, & Woodworth, 1989; Lipsey, 1992a, 1992b, 1992c, 1994; Wortman, 1992, 1994). Otherwise, the obtained mean effectiveness might be biased.

Explanatory Meta-Analysis

How can the influence of methodological variables be controlled? The answer to this question implies a step forward in the configuration of a meta-analysis: it is necessary to outline statistical models to explain the variability of the effect sizes as a function of a set of preselected study variables. The approach that Lipsey (1992a, 1992b, 1992c) proposes and, in fact, is applied in his recent meta-analysis on juvenile offender treatment, starts from an explanatory model of the effect size variability through hierarchical regression analysis by weighted least-squares. Table 7 shows the basic structure of the model. The main aspects of the model are the following:

Table 7: Statistical Model: Hierarchical Regression Analysis by Weighted Least Squares

$$Y_i = x_{i1}b_1 + x_{i2}b_2 + \ldots + x_{ip}b_p + x_{ip+1}b_{p+1} + x_{ip+2}b_{p+2} + x_{iq}b_q + e$$

Y: Vector of effect sizes
X_M: Submatrix of methodological variables
X_S: Submatrix of substantive variables
B: Vector of regression coefficients
E: Vector of random errors

$$\begin{bmatrix} Y_1 \\ Y_2 \\ . \\ . \\ Y_k \end{bmatrix} = \underbrace{\begin{bmatrix} x_{11} & x_{12} & . & . & x_{1p} \\ x_{11} & x_{22} & . & . & x_{2p} \\ . & . & . & . & . \\ . & . & . & . & . \\ x_{11} & x_{k2} & . & . & x_{kp} \end{bmatrix}}_{X_M\text{: Methodological variables}} \underbrace{\begin{bmatrix} x_{1p+1} & x_{1p+2} & . & . & x_{1q} \\ x_{2p+1} & x_{2p+2} & . & . & x_{2q} \\ . & . & . & . & . \\ . & . & . & . & . \\ x_{kp+1} & x_{kp+2} & . & . & x_{kq} \end{bmatrix}}_{X_S\text{: Substantive variables}} \underbrace{\begin{bmatrix} b \\ . \\ . \\ b \end{bmatrix}}_{B} \underbrace{\begin{bmatrix} e \\ e \\ . \\ . \\ e \end{bmatrix}}_{E}$$

1. The dependent variable is the effect size of the study.
2. The predictor variable matrix is composed of two submatrices, that is, methodological and substantive variables.
3. The estimation method is *by weighted least-squares* because each effect size proceeds from studies with different sample sizes; consequently, it is convenient to weight the variables by the inverse of the variance of the effect sizes (Hedges, 1994; Hedges & Olkin, 1985).
4. Since there will be numerous potential predictor variables, the selection must be guided by conceptual and theoretical criteria.
5. Furthermore, if we take into account that interrelationships among substantive and methodological variables exist, the entry order of these will have to be

determined beforehand and attending to theoretical criteria; but methodological variables will enter first in the model, and then the substantive variables. In this way, it is possible: (a) to determine the percentage of variance explained by methodological variables, and (b) to determine the percentage of variance explained by substantive variables *once the influence of methodological variables is eliminated.*

An example of this can be seen in Table 8 in which the results of a hierarchical regression analysis applied in the meta-analysis of Lipsey (1992a, 1992b, 1992c) are presented. The set of methodological variables explain 25% of the variance of effect size, a not negligible percentage. In addition, one can observe how the set of substantive variables still explained 22% of the remaining variance, once the influence of methodological variables was eliminated. Lipsey has shown that substantive variables influence the evaluation results. Moreover, he has built an explanatory model of the correctional program effectiveness as a function of study characteristics.

Table 8: Hierarchical Multiple Regression Analysis by Weighted Least Squares for Methodological and Treatment Variables

Step	Variable Cluster	Cumulative Multiple R	Cumulative R-square	R-square change	Change as proportion of total R-square
	Method			.25	.53
1	Samples	.20	.04	.04*	.09
2	Equivalence	.31	.10	.06*	.12
3	Attrition	.36	.13	.03*	.07
4	Control	.40	.16	.03	.06
5	Measures	.44	.20	.04*	.08
6	*ES* Info[a]	.46	.21	.01	.03
7	Interactions	.50	.25	.04*	.09
	Treatment			.22	.47
8	Subjects	.51	.26	.01	.02
9	Dosage	.53	.29	.03*	.07
10	Treatment	.63	.40	.11*	.24
11	Tcontext	.65	.42	.02*	.04
12	Interactions	.68	.47	.05*	.10

* $p < .05$
[a] *ES* Info: Degree of information about effect sizes
(Adapted from Lipsey, 1992, p. 117)

Lipsey's proposed multiple regression explanatory model can be complemented with the ideas recently developed by Rubin (1990, 1992). Rubin proposes to obtain

an explanatory model (for example, a multiple regression model) in which the more relevant substantive and methodological variables are combined with predictive purposes. Supposing that we have a regression model in which substantive and methodological variables are included, many questions could be answered such as: what is the effectiveness of the "A" treatment with a duration of "X" months and supposing a maximum design quality, no attrition, and a large sample size? One could try to configure an *effect size surface* capable of predicting future research and, consequently, guiding it adequately. Of course, to accomplish these predictions implies high risks if the explanatory model is misspecified. In such cases, the predictions would be made with extreme caution and always with orientative purposes for future research.

In conclusion, the main aim of this report is to emphasise the importance that meta-analyses on correctional treatment evaluation have to test the potential influence of methodological variables to amend the possible biases in the estimation of the effect size, and the convenience of testing explanatory models that take into account the set of more relevant methodological and substantive variables with predictive purposes. The future of meta-analysis shall go through that displacement from description to explanation.

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What Works in Correctional Rehabilitation in Europe: A Meta-Analytical Review

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Introduction

During the last decade important research initiatives have been undertaken to evaluate the functionality and profit of different models and techniques applied to delinquents and offenders. Prior to that period, in the seventies and at the beginning of the eighties, a few researchers analysed, in qualitative terms, collections of programmes of offender treatment to evaluate their contingent efficacy. These first inspections obtained, as a rule, negative results and transmitted a generalised pessimism about the possibilities of treating delinquency and crime effectively. The most widely disseminated conclusion of this period was delivered by Martinson, who in 1974 pronounced a kind of epitaph on this topic: in matters of rehabilitative efforts, "nothing works" (Martinson, 1974). This phrase became since then a customary notion of correctional literature (Pearson et al., 1995) and still many authors take issue with this at present.

However, the limits of these first qualitative reviews were great. On the one hand, these inspections were incapable of encompassing and relating the different factors implicated in the treatment programmes, such as the applied techniques' heterogeneity and the diversity of treated subjects, of application contexts, of methodology and of output measures. Furthermore, due to the limited precision of these first reviews, they also showed an evident inability to assess the contingent effects, be they small or partial, of some of the applied programmes. Certainly, when large volumes of information are reviewed in a qualitative manner, only general considerations can be obtained, similar to those where each researcher, according to his or her particular judgement, arrives to conclusions which are excessively generic and inaccurate. Of this manner, if we were to analyse programmes' effectiveness with delinquents and offenders, it would be very naïve to expect the programmes to eradicate the criminal behaviour of most of the treated subjects; therefore, the conclusion could not be other (and quite possible to advance before any efficacy review) than that the programmes failed absolutely. However, research questions so extreme and global, that only will admit global and extreme answers, do not appear to be raised from a scientific perspective, and more yet for a phenomenon so complex and multifactorial as crime.

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Preface

This book is the result of the Fourth European Conference of Psychology and Law, held in Barcelona in April, 1994. We would like to thank people who collaborated in the scientific and organising committees of the conference. Of special importance for the success of the meeting was the fine work of Jordi Bajet, Rosa Maria Martínez, Domènec Pérez, Maria Reales, Gemma Domingo, Begoña Orozco and Isabel Clemente.

Two institutions played a key role in supporting this event: The Catalan Board of Psychologists and the Center of Legal Studies of the Justice Department of Catalonia. The former provided financial support for the conference as well as valuable logistic and administrative assistance. The latter provided the facilities for the conference.

The preparation of this book has meant hard work for contributors and editors. The original papers were screened, completed and updated during the time that has elapsed since the Conference. We appreciate very much the patience shown by the authors, who committed themselves to a series of tasks that were necessary to produce the book in its final state. *Advances in Psychology and Law: International Contributions* would have not been possible without the altruistic and continuous collaboration of the colleagues of the first editor of this book at the Center of Legal Studies: Carlos Ferrer, Maribel Baños, Luis de Santiago, Orestes Martínez, Núria Rius-Pastor and Eulalia Luque. The editors would like to give special thanks to Antonio Marchal whose painstaking work over the past year in preparing the final copy has been indispensable. And last but not least, we want to express our gratitude to Elisabeth Abu Homos, Bianka Ralle and Christoph Schirmer from De Gruyter for their constant support and suggestions throughout all the editorial process.

The Editors

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Epilogue

The difference between impact evaluation and process evaluation and project monitoring can be seen using the five distinct components (impact, outcome, output, activities, and inputs) in the project monitoring and evaluation framework in Figure 1. 2 impact evaluation: methodological and operational issues. Figure 1 Project Monitoring and Evaluation Framework. Impact Outcomes.