De Theatro Motivarum, Motivation: In Search of Essentials. Research on a Theoretical Model of the Process of Motivation and on Critical Determinants of Interference

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Chapter 8
Empirical Research
Instruments for Competencies Enabling Conditions for Intervention in the Process of Motivation

8.1. Introduction

In Pre-Fundamentals to the study, Chapter 1.5., a reintroduction was proposed of explanatory theoretical Models designed through and originating from an analysis following a process of inductive inference. Where these theoretical Models lead to clearly defined and constrained hypotheses, they constitute not a departure from, but rather a re-enrichment of the hypothetico-deductive tradition. A choice in formulating hypotheses critical to those theoretical Models would provide a means of testing its robustness, with multiple hypotheses adding to its authority.

Thus, in a clear differentiation between inductively inferred theoretical Models and empirically tested deductive findings, through a formulation of hypotheses insights into the Process of Motivation could be obtained, and while extending a choice of hypotheses towards Determinants of a Process of Interference, the elementary processes involved in addressing Motivation could be targeted, in accordance with the Problem Statement defined for the study in Chapter 2.5.

A Model of Motivation was presented, from where Conditions could be formulated assumed to be needed for an Intervention to occur in a Process of Interference. Four Conditions were found to be essential, two of which appeared to provide opportunities best suited for addressing Motivation. In an analysis of Competencies assumed to be essential in initiating these Conditions, two main approaches or Modalities in Management of Motivation were prominent: An Extrinsic Modality and an Intrinsic Modality, each with their own specific characteristics.

In a final empirical research, Chapter 8 is to provide empirical evidence for the third Determinant in the Process of Interference: Instruments for Competencies enabling Conditions for Intervention in the Process of Motivation. Empirical research on its associated hypotheses would constitute a third supplemental verification of the Model.

The objective of Chapter 8 is derived from the Problem Statement defined in Chapter 2.5.:

- *to unveil elementary processes involved in addressing Motivation, by providing insights into the Process of Interference,*
    - *into exemplary Instruments that provide the means for these Competencies to occur, by means of:*
        - *a theoretical Model based on the Model of Motivation, as obtained through inductive inference, provided in a summarized overview,*

- *and empirical research providing evidence for a causal relation to exist between the isolated constructs operationalizing the Process of Motivation and concepts operationalizing these Instruments,*

  thus providing secondary empirical evidence in support of the Model of Motivation, from which these Instruments are derived.

8.2. Application of the Model of Motivation *An Analysis of Instruments*

As mentioned in Chapter 7.2.1., with reference to Appendix XXXIV, Section A., notably A.2., two Modalities emerged in Management of Motivation:

- *An Extrinsic Modality in Management of Motivation:* consisting of four levels of Intervention. The Modality was found to provide substantial opportunities for Control, at the expense, however, of Productivity.
- *An Intrinsic Modality in Management of Motivation:* consisting of four levels of Intervention. The Modality was found to lead to high Productivity, at the expense, however, of only limited opportunities to apply Control.

For each level of Intervention, then, an Instrumentation can be designed. Thus, in Management of Motivation, eight distinct Instruments apply, each addressing Motivation according to specific properties associated to a level of Intervention within a Modality in Management of Motivation.

However, given the Problem Statement, Chapter 2.5., which calls for an *exemplary* Instrument, a single Instrumentation, addressing a single level of Intervention is to be observed in the present study. Referring to Mennes (2016*, in press*), notably Chapter 13, a choice is made for the Intrinsic Modality in Management of Motivation, as virtually no literature appeared to have covered this Modality in addressing Motivation. From the four levels of Intervention, that constitute the Intrinsic Modality, the Intervention level that withholds addressing any Phase (level 8) appeared to yield highest results, and was chosen for the present and final Study.

Before proceeding towards the empirical research, a brief presentation is provided of the theoretical Model leading to the proposed Instrumentation based on the Model of Motivation, in accordance with the Problem Statement. Reference is made to Mennes (2016, *in press*), notably Chapter 12., for an extensive overview.

Prior to the analysis, a brief description of Assumptions is provided.

8.2.1. Assumptions Preceding an Analysis of Instruments

With reference to Appendix LX, Section A., it was assumed that an Instrument was to facilitate a Competency by creating an optimal setting. Thus, in accordance with its definition formulated in Chapter 2.3.2., the analysis was to define specific characteristics,

or properties in those Instruments that would enable the occurrence of an optimal setting.

The analysis of an optimal setting was assumed to include the following four so-called 'Properties':

- *Specification:* a definition of tools, techniques or utilities that enable a specific Intrinsic Intervention Competency to be expressed;
- *Organization:* a definition of structures or procedures that enable a specific Intrinsic Intervention Competency to be deployed;
- *Valuation:* a definition of means, or measures that enable a specific Intrinsic Intervention Competency to be examined and evaluated in its effects;
- *Preservation:* a definition of means, or measures that enable a specific Intrinsic Intervention Competency to be measured, tested and secured.

It was assumed that when each of these four Properties of a setting would be most favorable for the Intrinsic Competencies, an optimal setting would have been achieved.

8.2.2. An Analysis of Instruments

Two distinct Intrinsic Intervention Competencies, presented earlier in Chapter 7.2.2., were to be observed in the analysis for an optimal setting: Intrinsic Attitudinal Competencies, aimed at initiating Support and Intrinsic Technical Competencies, aimed at facilitating a Match in Mutual Perceptions.

Having defined an optimal setting for each of the Properties in relation to each of the Intrinsic Competencies, the inductive inference analysis defined the Instrumentation needed, as an enabling framework, to obtain such an optimal setting. Instruments that were to facilitate Intrinsic Attitudinal Competencies, were referred to as 'Intrinsic Attitudinal Instruments'. Instruments that were to facilitate Intrinsic Technical Competencies, were referred to as 'Intrinsic Technical Instruments'.

For further details on the inductive analysis, reference is made to an abbreviated overview in Appendix LX, Section B.

From the analysis, then, following Instruments emerged:

- *An Intrinsic Attitudinal Instrument:* a training setting provided for the Actor-Intervener, used as a principal vehicle aimed mainly at facilitating Intrinsic Attitudinal Competencies, enabling exposure, practice and experimentation, and providing a framework for evaluation;
- *An Intrinsic Technical Instrument:* a structured interview, provided to the Actor-Intervener aimed mainly at facilitating Intrinsic Technical Competencies, and presented as a written text-book, gradually progressing from a fixed to an open format.

8.2.3. *Conclusions*
Preamble to a Definition of Hypotheses

In Pre-Fundamentals to the study, it is assumed the Model obtained from an analysis of Instruments, as derived from the Model of Motivation, provides an explanatory context from which elementary hypotheses can be derived.

A choice was made for a single, so-called 'exemplary' Instrument, derived from the Model, to be used in the empirical research that is to provide evidence for a causal relation to exist between constructs operationalizing the Process of Motivation and concepts operationalizing these Instruments. The exemplary Instrument, as obtained from Mennes (2016, in press) as an optimal Instrumentation for an Intrinsic Modality in Management of Motivation, is an essential and critical construct derived from the Model of Motivation. Following the observations made in Chapter 1.5., the construct, then, is to be elementary in the formulation of subsequent hypotheses in Chapter 8.4.3

In a verification of the exemplary Instrument, empirical research on these hypotheses is to reflect on the Model of Motivation, from which the Instrument has been derived.

8.3. Operationalization

Two Instruments were derived through an inductive inference analysis, that were assumed to facilitate the Intrinsic Intervention Competencies that would initiate the Conditions deemed essential within an Intrinsic Modality to adequately address the Process of Motivation. A training setting was to facilitate especially the Intrinsic Attitudinal Competencies, and a structured interview was to facilitate mainly the Intrinsic Technical Competencies. Consequently, it is assumed that handling both Instruments would provide an Actor-Intervener with the tools to adequately address Motivation. Thus, exposure to the training setting and application of the structured interview is assumed to produce an effect on the Process of Motivation within an Individual. As the study is restricted to a business environment, as initially indicated in Chapter 2.4.3.3., the training setting and the structured interview are to be designed for a business environment with the empirical validation restricted to an in-company setting.

In Appendix LXI, Section A., a short description of procedures used and an overview of the training setting is presented, referred to as a training 'Management of Motivation'. For reasons of brevity a summary of training materials are provided relevant for an empirical validation. In Appendix LXI, Section B., an overview is provided of a structured interview, designated as 'PM Interview PMI-2.01', and presented in abbreviated format limited to information relevant for an empirical validation. For further overviews, reference is made to Mennes (2016, *in press*), notably Chapter 14.3.

In the empirical validation a registration is to be made of exposure to the training-program and application of the PM Interview PMI-2.01, where both are to be observed on their effects on the Process of Motivation.

8.4. Research Design

The empirical research, then, is aimed at providing evidence for a causal relation to exist between exposure to a specific training setting and application of a specific structured interview, and the occurrence of a successful Intervention within the Process of Motivation.

Thus a single assumption precedes the analysis: it is assumed that a causal relation exists between an application of the Instruments and a successful addressing of the Process of Motivation.

A verification of this assumption, has led to a sequential approach in the original research design presented in Mennes (2016, in press). To obtain evidence of a causal relation, a rationale for establishing cause-and-effect relationships was provided as a framework for the empirical research. This study adheres to common practice within standard literature to establish causality based on a rationale, which has materialized over the years into distinct variations of so-called 'experimental designs'. These experimental designs have a number of distinctive features in common: A group is exposed to an experimental event or variable, the effects of which are measured or observed in a temporal order. A brief overview of the rationale on defining cause-and-effect relations is provided in Appendix LXII, Section A., with reference to the more extensive exposé provided in Mennes (2016, in press), notably Chapter 14.4.

In the overview in the original research, a choice in experimental design was based on criteria of internal, external, construct and statistical conclusion validity, as based on observations following notably Campbell & Stanley (1963), Cook & Campbell, (1979), Shadish, Cook & Campbell (2002), leading to six distinct Studies, as briefly covered in Appendix LXII, Section B., with reference to more detailed overviews in Mennes (2016, in press), notably Chapter 14.4.1. and Chapter 14.4.2. Based on the Problem Statement to provide evidence for a causal relation to exist between concepts operationalizing an exemplary Instrument and constructs operationalizing the Process of Motivation, from these six Studies contained in the original design of experiment, a single study, Study 13, is chosen to represent the empirical research in this dissertation. To complement Study 13, a brief synopsis is provided of Study 12 and Study 14, which were related to Study 13 in the original research Project.

In the design of experiment a Posttest-Only Design Using an Independent Pretest Sample is proposed for Study 13, using separate pretest and posttest sampling groups with 'Diversification in Treatment', providing a distinction in treatments, or a distinction in the exposure of the group to the experimental condition. In both pretest and posttest settings the design of experiment is aimed at establishing evidence for a causal relation to exist between exposure to a specific training setting and application of a specific structured interview, operationalized by both a specific training-program 'Management of Motivation' and a concrete interview, the 'PM Interview PMI-2.01', with Experimental Groups consisting of employees exposed to the structured interview, and Control Groups consisting of unexposed subjects.

8.4.1. Statistics

The Problem Statement calls for evidence of a causal relation between the isolated constructs operationalizing the Process of Motivation and concepts operationalizing two Instruments that are assumed to provide the means for Intrinsic Intervention Competencies to occur.

A most widely used approach to establishing whether cause-and-effect relations exist is through so-called 'null hypothesis significance testing' (Shadish, Cook & Campbell, 2002; Lehmann & Romano, 2005). We will adhere to common practice, and will consider null hypothesis significance testing as the primal approach to establishing a cause-and-effect relation. In recent years, however, the approach has been criticized (Rosnow & Rosenthal, 1989; Cohen, 1990, 1994; Kirk, 1996; Schmidt, 1996; Ziliak & McCloskey, 2008)[1], and distinct suggestions have been made in reporting results (Wilkinson & The Task Force on Statistical Inference, 1999; American Psychological Association, 2001; Gliner, Leech & Morgan, 2002; Shadish, Cook & Campbell, 2002). Following these suggestions, and compensating for a number of potential threats to statistical conclusion validity, results of the Study will be reported using at least three indications:

- *p*-values, considered as exact probability levels of a Type I error from a null hypothesis significance testing
- accompanying effect size estimates
- accompanying 95% confidence intervals

Where relevant, in summarizing these findings in the respective discussions, conclusions and summaries, an abbreviated notation will include the statistic, its p-value or in case of significance the α-value used in establishing its significance, and its effect size estimate. As both effect size estimates and observed significance are presented, no indication of levels of statistical power will be provided, where both estimates give adequate information on the probability levels that the various analyses are able to detect an effect, inherent to an assessment of statistical power.

A series of statistical tools are to assist null hypothesis significance testing in the proposed research design aimed at establishing a cause-and-effect relation.

[1] According to Gliner, Leech & Morgan (2002) the misconceptions appear to be: (...) "(a) that the size of the *p* value indicates the strength of the relationship and (b) that statistical significance implies theoretical or practical significance" (p. 84). Shadish, Cook & Campbell (2002) state: (...) "The arguments (...) reduce to two: (1) scientists routinely misunderstand NHST, believing that *p* describes the chances that the null hypothesis is true (...) and (2) NHST tells us little about the size of an effect. Indeed, some scientists wrongly think that nonsignificance implies a zero effect" (...)(p. 43.), where 'NHST' refers to 'null hypothesis significance testing'.

1. ANOVA

In comparing basically two groups of Independent Pretest Posttest Samples, i.e. control versus experimental hence two levels of the independent variable, two approaches are eminent: a t-test or an analysis of variance (ANOVA). Where a Diversification in Treatment Groups is anticipated, and a method of comparing various Means is sought after, we follow common practice in choosing ANOVA to avoid unacceptable family-wise error rates. The ANOVA procedure is to be performed on both Experimental and Control Groups in respective pretest and posttest settings.

Four important assumptions underlie the ANOVA procedure. First, the dependent variable must be measured on at least an interval scale (Field, 2005). Furthermore, observations must be independent, with data obtained from a normally distributed population; finally, variances in each experimental condition are assumed to be fairly similar (Tabachnick & Fidell, 2001; Rutherford, 2001).

In the analyses, the first two assumptions are to be verified within the various data-sets. A Kolmogorov-Smirnov Test is to verify the assumption of normality in the observed distributions. Most psychological statistical texts, however, report the ANOVA procedure to be robust with respect to violations of the normality assumptions (Box & Andersen, 1955; Hays, 1994; Kirk, 1995; Lindman, 1974; Rutherford, 2001; Winer, Brown & Michels, 1991)[1], enabling a less conservative approach, where within the various Experimental and Control Groups with anticipated moderate sample sizes, a number are expected to deviate from normality (Rutherford, 2001). When sample sizes are comparable and greater than 12 (Clinch & Keselman, 1982; Tan, 1982), the various Groups within the experimental design are assumed to be derived from a population with normal distribution when at least ¾ of these various Groups appear to have a normal distribution according to the Kolmogorov-Smirnov Test. When the assumption is not met, a Kruskal-Wallis non-parametric Test is to be used as an alternative. Finally, in establishing validity of the fourth basic assumption of the ANOVA procedure, Levene's Test for Equality of Variances is to verify the assumption of homogeneity of variance. Where ANOVA seems to be less robust for violations of the homogeneity of variance assumption when sample sizes are unequal (Field, 2005; Glass, Peckham & Sanders, 1972[2]), alternative F-ratios are to be derived. From both alternative procedures provided in SPSS, the Welch F test will be chosen, as the approach appears as best alternative in terms of power (Tomarken & Serlin, 1986; Welch, 1951).

In the ANOVA procedure Motivation is to be captured using factor scores, associated with components DEDICAT and ACHIEV, following conclusions made in Chapter 5.5.3.

[1] Although Wilcox (1995, 1998) argues for negative effects on the power of ANOVA.

[2] Although several authors (Box 1954a, 1954b, Lindman, 1974) provide evidence that the F statistic appears to be quite robust against violations of the homogeneity of variance assumption.

2. One-way Independent ANOVA

The cause-and-effect analysis is to be initiated in the Posttest-Only Design Using an Independent Pretest Sample, with a One-way independent ANOVA test of the pretest posttest Experimental and Control Groups. A comparative introductory analysis of effects is to observe the principal Experimental and Control Groups in pre- and posttest settings. The introductory analysis is to present statistics with Means, Standard Deviations and sample sizes for each group with ANOVA F-ratio's and respective significance levels. As indicators for effect size estimates, Eta squared (η^2) is provided[1]. In contrast to current practice, we adhere to APA standards (APA, 2001; APA, 2010) and an increased appeal in recent publications (Vacha-Haase & Thompson, 2004; Fritz, Morris & Richler, 2012), to provide descriptions of effect size estimates for both significant and non-significant data[2].

3. Planned-Comparison for One-way Indepent ANOVA

Following the introductory analysis of pretest and posttest Experimental Groups, the analysis is to proceed in observing effects of Diversification in Treatment groups by means of a series of appropriate Planned-Comparisons to determine group differences. User-defined orthogonal contrasts are to determine overall and specific Group effects. From these independent contrasts t-tests are to be performed on the B-coefficients representing these contrasts in a multiple regression model where resulting p-values for these orthogonal comparisons are uncorrelated, thus avoiding inflated family-wise error rates. Following the observations made on null hypothesis significance testing, the analysis is to include Means and Standard Deviations for each group, with t-statistics for each contrast with respective significance levels, the contrast estimate B and its associated 95% confidence interval. As indicators for effect size estimates, Eta squared *(η^2)* estimates are provided. Summaries of these main statistics are presented, with reference to full overviews of Contrast Results in separate Appendices. Trend-analyses using polynomial contrasts are provided, restricted however to basic linear trends in the value of the dependent variables across categories.

[1] As Experimental and Control Groups are expected to have different sample sizes, η^2 is used for effect size estimates. However, as η^2 is solely based on sums of squares obtained from the sample, while a population estimate is desired, the statistic is slightly biased. While ω^2 appears to be a better effect size estimate as it also uses the variance explained by the model as one of its parameters, it is suggested the statistic be used only with equal sample sizes (Field, 2005; Howell, 2002).

[2] Although effect size estimates appear less relevant for non-significant effects, reporting effects sizes for all data is needed "for a reader to engage with, think through, and fully consider the implications of the results of a study" (...)(Fritz, Morris & Richler, 2012, p. 15). Moreover, as Vacha-Haase & Thompson (2004) demonstrate, a complete reporting facilitates meta-evaluative analyses of different research findings.

4. Two-way Independent Factorial ANOVA

The analysis in the Posttest-Only Design Using an Independent Pretest Sample is to conclude with a comparison between pretest and posttest situations to provide information on the direction of the effect of the treatment condition. As pretest and posttest samples are independent, the effects of treatment can only be deduced indirectly from the available data. A Two-way independent factorial ANOVA is to evaluate how pre- and posttest variables interact and what effects these interactions have on the observed dependent variables. The cause-and-effect analysis is to include a 2x2 factorial design, where the Experimental and Control Groups are observed on a factor Group (Experimental Group and Control Group) over a factor Time-of-Measure (pretest condition and posttest condition). An analysis is to be performed of the model in general, of its main effects, and of the interaction between both independent variables, where the analysis is to emphasize the model in general and the interaction, as both main effects have been the subject of analysis in previous sections. Where in previous sections the various descriptive statistics have been detailed, this third section is to include only an overview of F-ratio's for the overall model, the main effects and the interaction of the factorial ANOVA and respective significance levels with η^2 as indicator for effect size estimates.

As a supplement to the pretest posttest comparative analysis, Mean scores on the dependent variables, representing the effects on the Process of Motivation in both pre- and post treatment situations, are provided in a graph enabling a visualized summary of the analysis on the direction of the effect following the treatment condition.

In conclusion, outcomes of the various statistical procedures are to be provided for each Group comparison, referring to respective Appendices for reasons of brevity. Significance on all procedures is to meet minimal standards defined at $p<.05$.

All analyses are made using standard SPSS procedures (Norusis, 1990).

8.4.2. Sampling

For an adequate statistical analysis to be performed, a number of criteria are defined in assessing sample size. Following observations made in Chapter 8.4.1.1., for an ANOVA aimed at null hypothesis significance testing, it was assumed the various Groups of observation were to be derived in majority from a normal distribution. From literature it is suggested the assumption of normality is expected to be met when sample sizes are roughly comparable and greater than n=12 (Clinch & Keselman, 1982; Tan, 1982). Following these earlier observations, then, the various Groups within the experimental design are assumed to be roughly comparable with preferable sample sizes exceeding n=12. A normal distribution is to be observed occurring in at least ¾ of Groups as indicated by a Kolmogorov-Smirnov Test.

Overall response percentages in all data-samples are to exceed 70%.

8.4.3. Hypotheses

It is assumed that a causal relation exists between an application of Instruments and a successful addressing of the Process of Motivation. In establishing the cause-and-effect relation null hypothesis significance testing is to be used, where a series of ANOVA procedures on different Groups within the sampling population is to provide confirmation for these assumptions.

Prior to formulating the hypotheses for testing, however, a number of final observations are made.

First, a choice was made for an analysis aimed exclusively at Instruments enabling Intrinsic Intervention Competencies. As a consequence, a final verification of hypotheses is to be performed uniquely aimed at Intrinsic Intervention Competencies.

In a second observation, factor scores DEDICAT and ACHIEV will be used to capture the Process of Motivation. However, following the exposés in Chapter 3.3.2., Chapter 6.4.3. and Chapter 7.4.3., exposure to the Instruments is assumed to affect Phases 5, 6, 7 and 8 in the Model of Motivation to a higher extent than Phases 1, 2 and 3, resulting in expected higher effects associated with factor score component DEDICAT, indicative of Phases 5, 6, 7 and 8, than with factor score component ACHIEV, indicative of Phases 1, 2 and 3. As such, in demonstrating an assumed cause-and-effect relation, factor score component DEDICAT is to be predominant in a formulation of hypotheses.

Following these preliminary observations, and following observations on a choice of Study 13 as research design proposed in Chapter 8.4., a number of hypotheses are to be met to provide an adequate confirmation for an assumed cause-and-effect relation between an application of the Instruments and a successful Intervention in the Process of Motivation, as indicated in the Problem Statement.

Preceding the hypotheses for testing are a number of definitions restricting the empirical verification:

- *'Measurement' is restricted to a pretest measurement and a posttest measurement following the treatment condition.*
- *The period between pretest and posttest is to be observed ranging over a period not exceeding 3 x 12 months, where a posttest measurement is not to exceed 12 months after exposure to the treatment condition.*
- *The measurement of the Process of Motivation is assumed to occur using the so-called 'elementary components' captured in factor score components DEDICAT and ACHIEV, where DEDICAT is to be predominant in a formulation of hypotheses.*
- *'Instruments' are defined as a training setting and a structured interview, with reference to Chapter 8.3.*
- *'Exposure to the Instruments' is defined as exposure of the Actor-Intervener to a training setting, as defined in Appendix LXI, Section A, and exposure of the Individual to a structured interview, as defined in Appendix LXI, Section B. As such, 'exposure to the Instruments' is considered to be the experimental*

exposure to the treatment condition. A diversification is made in four conditions[1]*:*

- *... a 'single exposure', where the Actor-Intervener participates in a training setting, and the Individual is exposed to a single structured interview, at time of posttest observation,*
- *... a 'two-fold exposure', where the Actor-Intervener participates in a training setting, and the Individual is exposed to two structured interviews, at time of posttest observation,*
- *... a 'three-fold exposure', where the Actor-Intervener participates in a training setting, and the Individual is exposed to three structured interviews, at time of posttest observation,*
- *... a 'four-fold exposure', where the Actor-Intervener participates in a training setting, and the Individual is exposed to four structured interviews or more, at time of posttest observation.*

From these restricting definitions, following hypotheses are formulated:

- *Hypothesis 1 (H1): It is hypothesized that addressing the Process of Motivation by means of exposure to the Instruments leads to a significantly higher Motivation within the Experimental Group as compared to a Control Group that has had no such exposure. A diversification for H1 is made in four additional variations:*
  - *a) Hypothesis 1A (H1A): It is hypothesized that addressing the Process of Motivation by means of a single exposure to the Instruments leads to a significantly higher Motivation within the Experimental Group as compared to Control Groups that have had no such exposure.*
  - *b) Hypothesis 1B (H1B): It is hypothesized that addressing the Process of Motivation by means of a two-fold exposure to the Instruments leads to a significantly higher Motivation within the Experimental Group as compared to Control Groups that have had no exposure.*
  - *c) Hypothesis 1C (H1C): It is hypothesized that addressing the Process of Motivation by means of a three-fold exposure to the Instruments leads to a significantly higher Motivation within the Experimental Group as compared to Control Groups that have had no exposure.*
  - *d) Hypothesis 1D (H1D): It is hypothesized that addressing the Process of Motivation by means of a four-fold, or higher, exposure to the Instruments leads to a significantly higher Motivation within the Experimental Group as compared to Control Groups that have had no exposure.*

[1] In defining 'exposure to the Instruments', a decision was made to make no distinction between the training setting aimed at the Actor-Intervener, and the structured interview aimed at the Individual. As a consequence however, the definition especially of a 'two-fold', 'three-fold' and 'four-fold' exposure could have an ambiguous connotation as in all three instances the Actor-Intervener is exposed to a single training setting, with only the Individual exposed to multiple structured interviews.

Where a 'significantly higher Motivation' is defined as:

- *Component DEDICAT generating significantly superior scores within the Experimental Group as compared to the Control Group on the posttest condition, as opposed to scores that are comparable amongst Experimental and Control Groups on the pretest condition*[1].
- *Component ACHIEV generating no significant differences in scores within both Experimental and Control Groups.*

Given the initial assumption stated Chapter 8.4., when these hypotheses are met, it is assumed that evidence will have been provided for a causal relation to exist between the isolated constructs operationalizing the Process of Motivation and concepts operationalizing exemplary Instruments, as indicated in the Problem Statement, Chapter 2.5.

A confirmation of these hypotheses will provide secondary empirical evidence in support of the Model of Motivation, from which these Instruments are derived.

8.4.4. *Conclusion*s

The present Chapter was to define an experimental design aimed at establishing evidence for a cause-and-effect relation between application of Instruments and a successful Management of Motivation.

The empirical research is to provide causal evidence in a single Experimental Study, with a brief synopsis of two additional Studies in a following research design, with reference to the extensive design of experiment covered in Mennes (2016, in press), notably Chapter 14.:

- *Study 12: Comparative Analysis Independent Measures: a brief Synopsis of a Posttest-Only Design Using an Independent Pretest Sample, with Diversification In Control Groups.*
- *Study 13: Comparative Analysis Independent Measures: A Posttest-Only Design Using an Independent Pretest Sample, with Diversification in Treatment Groups. The Study is aimed at verification of H1, notably H1A, H1B, H1C and H1D.*
- *Study 14: Comparative Analysis Dependent Measures: a brief synopsis of an Untreated Control Group Design With Dependent Pretest and Posttest Samples.*

[1] As the Independent Group Design does not provide an adequate experimental design to compare pretest and posttest conditions over time, only the posttest condition can be used to demonstrate effects of treatment in comparison to non-treatment. In a Dependent Group Design, a within-subjects factor Time allows for observations comparing both pretest and posttest conditions, hence producing two distinct statuses to be observed in detecting a significant improvement in levels of Motivation.

8.5. Empirical Research
Experimental Studies: Comparative Analyses
8.5.1. Study 12: Comparative Analysis Independent Measures
Diversification in Control Groups

Referring to Mennes (2016*, in press*), notably Chapter 14.5.1., Study 12 was the first of a series aimed at verifying the assumption of a cause-and-effect relation between an application of Instruments and a successful addressing of the Process of Motivation. Study 12 was performed within Company XXI, with reference to Appendix LXIII. As stated Chapter 8.4., a brief summary is provided, as a first introduction to Study 13.

The Study aimed at verification only of hypothesis H1C, as a result of data-sampling. The Comparative Analyses were performed in three phases.

In the first phase, an introductory One-way independent ANOVA was performed, testing the principal Experimental and Control Groups in both pretest and posttest settings. The analysis provided a first confirmation of hypothesis H1C, where a three-fold exposure to the Instruments was assumed to have had a significant positive impact on Motivation as captured by component DEDICAT within the Experimental Group as compared to the Control Group, with Welches' $F(1, 38.15)=5.14$, $p<.05$, $\eta^2=.020$, on the posttest condition, as compared to $F(1, 144)=0.76$, $p=.38$, $\eta^2=.005$, on the pretest condition.

A second phase, consisted of a Planned-Comparison, allowing for an analysis with Diversification in a number of Control Groups. A Planned-Comparison for the Experimental Group versus the combined Control Groups, revealed no significant differences in the pretest setting, with $t(255)=1.79$, $p=.08$ (two-tailed), $\eta^2=.018$, whereas in the posttest condition a significant difference appeared for the Experimental Group after treatment, with $t(30.45)=-2.50$, $p<.05$ (two-tailed), $\eta^2=.011$. A Planned-Comparison with Diversification in separate Control Groups, revealed significant results on two of the three Control Groups in the posttest condition, $t(38.15)=2.27$, $p<.05$ (two-tailed), $\eta^2=.011$, $t(46.46)=2.23$, $p<.05$ (two-tailed), $\eta^2=.011$, and $t(43.37)=1.49$, $p=.14$ (two-tailed), $\eta^2=.011$, respectively, as opposed to non-significant results in the Planned Comparison in the pretest condition, $t(225)=-.87$, $p=.39$ (two-tailed), $\eta^2=.018$, $t(225)=-1.76$, $p=.08$ (two-tailed), $\eta^2=.018$, and $t(225)=-1.59$, $p=.11$ (two-tailed), $\eta^2=.018$ respectively. A full overview of these Planned-Comparisons for One-way independent ANOVA in both pretest and posttest situations is provided in Appendix LXIV and Appendix LXV respectively.

Finally, in a third and final phase of the Comparative Analysis, a Two-way independent factorial ANOVA was performed, evaluating the interaction of pre- and posttest variables and the effects of these interactions on the observed factor score component DEDICAT, capturing Motivation. Results were in line with previous findings, where a significant effect for the model in general was obtained, with $F(3, 406)=8.32$, $p<.001$, $\eta^2=.058$, and a significant interaction effect between Group and Time-of-Measure on Motivation, $F(1, 406)=4.10$, $p<.05$, $\eta^2=.010$.

No significant results were obtained on pre- and posttest conditions for factor score component ACHIEV, in confirmation with preliminary observations made in Chapter 8.4.3.

As a principal outcome it was concluded that Study 12 did provide a first evidence for the assumption that a causal relation exists between an application of the Instruments and a successful addressing of the Process of Motivation, thus confirming hypothesis H1C, Chapter 8.4.3.

8.5.2. Study 13: Comparative Analysis Independent Measures *Diversification in Treatment Groups*

Referring to Mennes (2016, in press), notably Chapter 14.5.2., Study 13 was the second in a series of separate Studies aimed at verifying the assumption of a cause-and-effect relation between an application of Instruments and a successful addressing of the Process of Motivation. The Study is presented to provide support for the assumption that exposure to a specific Instrumentation, would lead to improved Motivation as compared to a Control Group, thereby providing secondary evidence in support of the Model of Motivation, from which the design of the Instruments is derived.

Thus, Study 13 aims at a verification of Hypothesis H1, defined in Chapter 8.4.3., hypothesizing that addressing the Process of Motivation by means of exposure to these Instruments would lead to a significantly higher Motivation within an Experimental Group as compared to a Control Group that has had no such exposure. A Diversification in Treatment Groups is to observe the effects of multiple exposures.

The Study follows a Posttest-Only Design Using an Independent Pretest Sample.

1. Methodology

Sample; Following Study 12, a second company was approached by third parties, around the end of 2002. Although the issue of anonymity, appeared to be prominent for this second company, Company XXII, it was decided by the Management Team each employee could be approached by the researcher to provide employee-related information on an individual basis, using employee-registration numbers issued by the company. As this information was provided on a voluntary basis, it was initially anticipated the Study would provide insufficient numbers for a Comparative Analysis using Dependent Measures in a pretest posttest design. As a consequence, in Study 13 an Independent Group Design was chosen[1].

Company XXII graciously provided no restrictions on exposure to the Instruments, thus enabling a full Diversification in Treatment, with subject-exposure to treatment covering one, two, three and four exposures to the treatment condition depending on the number of structured interviews held per subject. Subjects with no exposure to the treatment condition were considered to be the Control Group in the posttest condition. Independent Pretest Samples were randomly assigned to five Groups from the population prior to treatment. Pretest and Posttest sampling occurred within the 3 x 12 months time-constraints defined in Chapter 8.4.3. As a result, in the Comparative Analysis sampling consisted of five randomly assigned, pretest Experimental and Control Groups, and four Experimental Groups, with one Control

[1] As it appeared at the end of the Study, the number of subjects on the posttest measurement providing their employee-registration number proved to be adequate to allow for a modest pretest posttest Dependent Group Design, as presented in a Synopsis of Study 14, Chapter 8.5.3.

Group in the posttest condition, with asymmetry in sampling-sizes occurring between pretest and posttest Groups.

Treatment and non-Treatment Groups were not assigned by chance: non-random assignment occurred, as management was free to decide which employees were exposed to the structured interview, and the number of sessions they held with each employee.

A short description of Company XXII is provided in Appendix LXIII. Details of the test samples are provided in Table 8.1.

Procedure; It was assumed that exposure to the Instrumentation of the training setting and application of the structured interview by an Actor-Intervener was to produce a successful Intervention in the Process of Motivation within an Individual. Within the setting of a business environment, the Actor-Intervener was represented by management, the Individual by the employee.

				Original Sample			
		Sampling date		n	N Response		
			(1)	Abs	Abs	%	
	Company XXII						
1	Pretest						(2)
	Random Group 1	12-2003	EG	36			
	Random Group 2	12-2003	EG	36			
	Random Group 3	12-2003	EG	36			
	Random Group 4	12-2003	EG	36			
	Random Group 5	12-2003	CG	36			
	Unclassified	12-2003		3			(3)
		Totals		183	224	81.7%	
2	Posttest						(4)
	Exposure to Treatment Condition:						
	1x Exposure	01-2006	EG	23			
	2x Exposure	01-2006	EG	69			
	3x Exposure	01-2006	EG	17			
	4x Exposure	01-2006	EG	22			
	No Exposure	01-2006	CG	39			
	Unclassified	01-2006		20			(5)
		Totals		190	229	83.0%	

Notes:
(1) EG = Experimental Group CG = Control Group
(2) Experimental and Control Groups in the Pretest condition were obtained through random sampling from the pretest population
(3) Rest-category of subjects eliminated from the Pretest population as a result of the random assignment in five comparable samples
(4) Experimental Groups consisted of subjects with single or multiple exposure to the Treatment condition The single Control Group consisted of subjects with no exposure to the Treatment condition
(5) Rest-category of subjects eliminated from the Posttest population as a result of providing no, or insufficient information on exposure to Treatment condition

Table 8.1.
Summarized sampling characteristics of the Comparative Analysis Independent Measures sample

Within the setting of a business environment, the experiment was conducted in a following sequential procedure:

- *Pretest:* Prior to exposure to the treatment condition, the HF-2.01 questionnaire was used containing evaluative items on Motivation, as described in Chapter 5.3. and Appendix III. The questionnaire was administered to all employees. The HF-2.01 questionnaire was used to generate factor scores associated to components DEDICAT and ACHIEV, capturing the concept of Motivation, following conclusions made in Chapter 5.5.3. Within the total group of respondents, subjects were randomly assigned to five equally sized samples, aimed to match as Independent Pretest Samples, their equivalents in the posttest condition. Within these matching pairs, four groups were randomly assigned as Experimental Groups, anticipating on the four Experimental Groups in the posttest stage of the experiment, and one Group as Control Group, as an independent match to the single posttest Control Group.
- *Treatment:* Following the pretest, the intervention stage consisted of exposure to the two-fold Instrumentation: the training setting and the structured interview. As no restrictions were set by the company on exposure, the experimental setting provided an environment where a Diversification in Treatment could be made. Exposure to treatment occurred in a following successive order:
  - *Training sessions:* Following the pretest measurement, a series of training sessions were held prior to the experiment, during which the entire management team of Company XXII was exposed to the training setting as defined in Appendix LXI, Section A. The training sessions were held directly after the pretest measurement, in successive sessions, each consisting of 8-10 members of management. In each training, two sessions were held, a 2½ day session and a 1 day follow-up[1].
  - *Structured interviews:* Following the training sessions, the intervention stage consisted of exposure to the structured interview, as defined in Appendix LXI, Section B. The decision on the frequency of exposure to the treatment condition was left to individual managers: some managers held only a single interview with their staff, others held multiple interviews, some involved their entire staff, whereas others held interviews with only a selection of their employees.
- *Posttest:* For the posttest measurement of effects, the HF-2.01 questionnaire was again administered to all employees. Posttest measurement occurred 26 months after pretest measurement. Depending on the frequency of exposure to treatment as reported by employees on the posttest measurement, a Diversification in Treatment was made in four groups: employees reporting exposure to a single structured interview were assigned to Experimental Group

[1] 14 Months after the training session, another 1-day follow-up was held, where best practice experiences were exchanged by management team members.

A, employees reporting having had two structured interviews, and thus two exposures to the treatment condition, were assigned to Experimental Group B, employees reporting three exposures, to Experimental Group C, and employees reporting at least four exposures, to Experimental Group D. As a consequence, a Diversification in Treatment was achieved including four Experimental Groups with 1x, 2x, 3x, and 4x, or more exposures to the experimental condition. As such, the empirical research in Study 13 aimed at verification of hypothesis *H1*, could be further diversified into a verification of hypothesis *H1A, H1B, H1C* and *H1D* defined in Chapter 8.4.3. In contrast, employees reporting they had had no exposure to the treatment condition were designated as Control Group E in the posttest measurement of effects.

Following this procedure, a design of experiment was obtained as visualized in Fig. 8.1. In order to maintain a synergy with the original design of experiment from which Study 13 was obtained, the Experimental and Control Group numbered references from the original design were preserved. Reference is made to Mennes (2016, *in press*), notably Chapter 14.4.2.3., Fig. 14.3., reproduced in Appendix LXII, Section B., Fig. A.

Thus, referring to Fig. 8.1., four randomly assigned Experimental Groups EG_{O3A}, EG_{O3B}, EG_{O3C} and EG_{O3D}, were obtained in the pretest condition as Independent Pretest Samples matching those in the posttest condition, according to the research defined as a Posttest-Only Design Using an Independent Pretest Sample. In the pretest condition, a fifth Group was randomly designated as Control Group CG_{O3E}, intended to act as a match to the Control Group in the posttest condition. Following exposure to the treatment condition, Diversification in Treatment was obtained by observing four Experimental Groups: EG_{O4A} with a single exposure, EG_{O4B} with a two-fold exposure, EG_{O4C} with a three-fold exposure, and EG_{O4D} with a four-fold exposure to the structured interview, as part of the treatment condition. In contrast, a single Group, reporting no exposure to the treatment condition, was designated as Control Group CG_{O4E}.

NR	O_{3A}	X_A	O_{4A}
NR	O_{3B}	X_B	O_{4B}
NR	O_{3C}	X_C	O_{4C}
NR	O_{3D}	X_D	O_{4D}
NR	O_{3E}		O_{4E}

Notation (following Shadish, Cook & Campbell, 2002):
NR – Non Random Assignment
X – Exposure to Treatment or Experimental Event
O – Process of Observation or Measurement
A vertical dashed line indicating sample independence

Fig 8.1.
A Visualized Overview of the Posttest-Only Research Design Using an Independent Pretest Sample as used in the Comparative Analysis of Study 13.

Hypotheses; The quasi-experimental design is aimed at null hypothesis significance

testing through a Posttest-Only Design Using an Independent Pretest Sample, with Diversification in Treatment Groups, as stated Chapter 8.4.

In a three-fold cause-and-effect analysis, to this aim, following hypotheses are defined, with reference to Chapter 8.4.3.:

- *Hypothesis 1, with a diversification in variations H1A, H1B, H1C and H1D as a result of the posttest data sampling enabling a Diversification in Treatment:* It is hypothesized that addressing the Process of Motivation by means of exposure to the Instruments leads to a significantly higher Motivation within Experimental Groups as compared to a Control Group that has had no such exposure. In hypothesis *H1,* four variations are defined according to exposure:

- Hypothesis 1A *(H1A)*: a higher Motivation as a result of a single exposure,
- Hypothesis 1B *(H1B)*: a higher Motivation as a result of a two-fold exposure,
- Hypothesis 1C *(H1C)*: a higher Motivation as a result of a three-fold exposure,
- Hypothesis 1D *(H1D)*: a higher Motivation as a result of a four-fold, or higher, exposure.

Given the earlier observations on component DEDICAT as principal indicator of Motivation, the various hypotheses can be restated in following forms, with special reference in the notations used for component DEDICAT, that an associated *lower* factor score is indicative of a *higher* Motivation[1]:

H1A is considered valid,
while $DEDICAT_{O3A} = DEDICAT_{O3E}$, *then* $DEDICAT_{O4A} < DEDICAT_{O4E}$,

where H_0*: while* $DEDICAT_{O3A} = DEDICAT_{O3E}$, *then* $DEDICAT_{O4A} >= DEDICAT_{O4E}$.

H1B is considered valid,
while $DEDICAT_{O3B} = DEDICAT_{O3E}$, *then* $DEDICAT_{O4B} < DEDICAT_{O4E}$,

where H_0*: while* $DEDICAT_{O3B} = DEDICAT_{O3E}$, *then* $DEDICAT_{O4B} >= DEDICAT_{O4E}$.

H1C is considered valid,
while: $DEDICAT_{O3C} = DEDICAT_{O3E}$, *then* $DEDICAT_{O4C} < DEDICAT_{O4E}$,

where H_0*: while* $DEDICAT_{O3C} = DEDICAT_{O3E}$, *then* $DEDICAT_{O4C} >= DEDICAT_{O4E}$.

H1D is considered valid,
while: $DEDICAT_{O3D} = DEDICAT_{O3E}$, *then* $DEDICAT_{O4D} < DEDICAT_{O4E}$,

where H_0*: while* $DEDICAT_{O3D} = DEDICAT_{O3E}$, *then* $DEDICAT_{O4D} >= DEDICAT_{O4E}$.

[1] Hypotheses *H1A, H1B, H1C* and *H1D,* are formulated according to the respective Experimental Group associated with each specific hypothesis, without referring to other Experimental Groups.

In addition, a trend-analysis is to be used in testing the hypotheses:

while: $Trend\_DEDICAT_{O3A,\ O3B,\ O3C,\ O3D} = DEDICAT_{O3E}$, *then* $Trend\_DEDICAT_{O4A,\ O4B,\ O4C,\ O4D} < DEDICAT_{O4E}$,

where H_0: *while* $Trend\_DEDICAT_{O3A,\ O3B,\ O3C,\ O3D} = DEDICAT_{O3E}$, *then* $Trend\_DEDICAT_{O4A,\ O4B,\ O4C,\ O4D} >= DEDICAT_{O4E}$.

Measures; In the analysis following measures are defined:

- *Independent variable:* The Study includes two independent variables, defined as 'Group' and 'Time-of-Measure'. The independent variable 'Group' is exposure to the structured interview, with Diversification in Treatment in the Experimental Groups, including a single, a two-fold, a three-fold and a four-fold exposure, or more, to the treatment condition, and a Control Group having had no exposure to treatment. The independent variable 'Time-of-Measure' is the time of observation, in either pretest and posttest condition.

- *Dependent variable:* The dependent variable is Motivation, as captured following conclusions made in Chapter 5.5.3., with components DEDICAT and ACHIEV represented by their respective factor scores, with essential items defined as follows:

- Component DEDICAT, consisting of items referenced as: ce, cf, cg, ci, cs, ct, dz and eb from questionnaire HF 2.01
- Component ACHIEV, consisting of items referenced as: at, au, av, ba, bb and bc from HF 2.01

Factor scores were defined following the methodology described in Chapter 5.7.1.1., summarized in Chapter 5.7.2. A full description of these items and references was provided in Appendix III, Section B., and Table 5.3.

Analysis; Following Chapter 8.4.1., the Comparative Analyses were performed in three phases:

- *An introductory One-way independent ANOVA,* testing the principal Experimental and Control Groups in both pretest and posttest settings. In the introductory ANOVA a choice for the principal Experimental Group was made for the Group with highest number of exposures to the treatment condition. As a consequence, the introductory ANOVA aimed at a verification of hypothesis *H1D.* Following conclusions in Chapter 5.5.3., a distinction was made in the analysis between factor scores DEDICAT and ACHIEV.
- *A Planned-Comparison for One-way independent ANOVA,* allowing for an analysis with Diversification in Treatment Groups. The Planned-Comparison was performed to assess effects of treatment in three analyses:
    - *Planned-Comparison for the combined Experimental Groups versus the Control Group:* Effects were observed on all four treatment conditions combined versus the Control Group in pretest and posttest settings. The analysis was presented as a first introduction to the Planned-Comparison.

- *Planned-Comparison for separate Experimental Groups versus the Control Group:* To assess effects in frequency of exposure, a subsequent analysis was made of effects of each of the four distinct treatment conditions in pretest and posttest settings.
- *Trend-analysis:* Given the sequential order in which the Treatment Groups could be observed, a trend-analysis using polynomial contrasts was provided, restricted to a basic linear trend in the value of the dependent variable across the four Treatment categories.

In all three analyses, a distinction was made between the two factor scores representing the Process of Motivation.

- *A Two-way independent factorial ANOVA,* evaluating how pre- and posttest variables interact and effects of these interactions on the observed dependent variables, after exposure to treatment.

With the experimental design aiming at null hypothesis significance testing, it was assumed that a cause-and-effect relation would be valid, when in the respective analyses of variance a significant difference in measures was found at a standard $p<.05$ level, following criteria set in Chapter 8.4.1.

Again, all assessments were made using standard SPSS procedures (Norusis, 1990).

2. Results

With reference to Table 8.1., the data-sets for the experiment were obtained with a pretest total sample size of n=183, and a posttest sample size of n=190, both within criteria of response percentages formulated in Chapter 8.4.2.

Prior to the first phase of the Comparative Analyses of the One-way independent ANOVA, a number of preliminary analyses were made. Following the exposé in Chapter 8.4.1.1., a first assumption underlying the ANOVA procedure, where dependent variables were expected to be measured at least at an interval scale with independent observations in the experimental setting, was considered to be valid. No deviation from normality was observed in the distribution of data for factor score component DEDICAT, following a Kolmogorov-Smirnov Test, where no significant values were obtained, with pretest scores $D(36)=0.07,\ p=.20$ for Experimental and $D(36)=0.10,\ p=.20$ for Control Groups, and posttest scores $D(22)=0.12,\ p=.20$ for the Experimental Group. However, the assumption of normality appeared to be violated for the posttest Control Group with $D(39)=0.16,\ p<.01$. Although these K-S scores are still within the range of criteria set in Chapter 8.4.1.1. in determining acceptance of the assumption of normality, with ¾ of observed Groups meeting required criteria of normality, the data are to be observed with caution, where a discrepancy in sample sizes was also observed. The assumption of homogeneity of variance was met for all Groups for factor score component DEDICAT, following Levene's Test as indicated in Chapter 8.4.1.1., with $F(1,70)=1.17,\ p=.28$ for the pretest Experimental and Control Group

comparison, and Levene's $F(1,59)=0.42,\ p=.52$ for the posttest comparison. For factor score component ACHIEV no violation of basic assumptions was observed, with Kolmogorov-Smirnov values in pretest scores of $D(36)=0.12,\ p=.20$ for the principal Experimental and $D(36)=0.09,\ p=.20$ for Control Groups, and with respective posttest scores $D(22)=0.15,\ p=.19$ and $D(39)=0.10,\ p=.20$, confirming the assumption of normality. Finally, no significant values were obtained for Levene's Test with $F(1,70)=0.02,\ p=.88$ for the pretest, and $F(1,59)=0.11,\ p=.74.$ for the posttest comparison, thus accepting the null hypothesis that the difference between variances was zero and therefore that the assumption was tenable that variances could be considered as roughly equal.

The cause-and-effect analysis was initiated with a One-way ANOVA comparative test of the principal pretest and posttest Experimental and Control Groups. Outcomes of the introductory analysis are provided in Table 8.2.

The introductory ANOVA tested the hypothesis that the Means of the principal Experimental Group differs from the Control Group in pre- and posttest settings, with a null hypothesis assuming that all group Means are the same. Within the pretest condition for factor score component DEDICAT both Means appeared to be comparable with $F(1,\ 70)=0.07,\ p=.79,\ \eta^2=.001$. In the posttest condition, after exposure to the Instruments, i.e. after a four-fold exposure by employees to the structured interview, following training sessions with management performing these interviews, a significant effect appeared of the treatment condition on levels of Motivation as captured by factor score component DEDICAT, with $F(1,\ 59)=5.97,\ p<.05,\ \eta^2=.092$. The F-ratio represents the measurement of systematic to unsystematic variation, or rather, the average amount of variation as explained by the model, MS_M, versus the amount of variation explained by the various extraneous variables, MS_R. With an F-ratio of 5.97 for the posttest condition, the systematic variation as explained by the model, far exceeded the unsystematic variation explained by extraneous variables. As a result it was concluded that the experimental treatment had an effect above the effect of individual differences. And given the F-value also exceeded a critical value one would expect to obtain by chance alone in an F-distribution with comparable degrees of freedom, the observed value was considered to be significant in indicating a treatment effect.

No such effects were observed for factor scores associated with component ACHIEV on the posttest condition with $F(1,\ 59)=2.20,\ p=.14,\ \eta^2=.036,$ with a previous observation on the pretest condition of $F(1,\ 70)=3.28,\ p=.07,\ \eta^2=.045.$

Given that in first observations in the Comparative Analysis a choice of the principal Treatment Group in pretest and posttest situations was made for the Experimental Group with highest number of exposures to the treatment condition, the introductory ANOVA aimed at verification of hypothesis H1D, defined Chapter 8.4.3. Findings provided a confirmation for the hypothesis, where frequent exposure to the Instruments was assumed to have a significant positive impact on Motivation as captured by component DEDICAT within the Experimental Group as compared to the Control Group that had no exposure to treatment.

	Pretest			Posttest			(5)(6)
	EG O3D	CG O3E	ANOVA	EG O4D	CG O4E	ANOVA	
	M (SD) N	M (SD) N	F η²	M (SD)	M (SD)	F η²	
(1)	(2)	(2)	(3)	(2)	(2)	(3)(4)	
1. DEDICAT	-0.20 (0.97) 36	-0.26 (0.79) 36	0.07 .001	-0.49 (1.04) 22	.18 (1.03) 39	5.97 * .092	
2. ACHIEV	-0.49 (1.05) 36	-0.04 (1.06) 36	3.28 .045	-0.48 (0.87) 22	-0.14 (0.86) 39	2.20 .036	

Notes:
(1) Factorscores
(2) M = Mean SD = Standard deviation N = Sample size
(3) F = F-Ratio η² = Eta squared
*(4) * Statistic significant at the 0.05 level*
*** Statistic significant at the 0.01 level*
**** Statistic significant at the 0.001 level*
(5) EG = Experimental Group CG = Control Group
(6) In the subscript, reference is made to the Experimental and Control Group indications in Fig. 8.1.

Table 8.2.
One-way independent ANOVA of principal Experimental and Control Groups on levels of Motivation, as captured by factor scores of components DEDICAT and ACHIEV in Pre- and Posttest Settings;
A Summary of Main Results

Following these first findings from the principal Experimental Group, in a second analysis, a Planned-Comparison was performed to assess effects of Diversification in Treatment Groups. Groups with a single, a two-fold, and a three-fold exposure to the treatment condition were included in the research design. The Planned-Comparison analysis included an analysis of the combined Experimental Groups, an analysis of these Groups separately and a trend-analysis.

Preliminary testing of basic assumptions revealed no violations of assumed normality and equality in variances for the pretest condition. Following a Kolmogorov-Smirnov Test, no significant values were obtained for the three additional Experimental Groups EG_{O3A}, EG_{O3B} and EG_{O3C} in factor scores of component DEDICAT, with respective pretest scores $D(36)=0.08$, $p=.20$, $D(36)=0.13$, $p=.10$, and $D(36)=0.14$, $p=.07$, and Levene's $F(4,175)=1.93$, $p=.11$. Conditions in the posttest phase diverged, with one additional Experimental Group, EG_{O4B}, deviating from normality, with respective K-S scores $D(23)=0.17$, $p=.07$, $D(69)=0.12$, $p<.05$ and $D(17)=0.13$, $p=.20$. Although, in addition to the posttest Control Group CG_{O4E} mentioned earlier, with K-S score $D(39)=0.16$, $p<.01$, only two Groups within the experimental setting revealed a violation of assumed normality, thus meeting the criteria set in Chapter 8.4.1.1. for determining

acceptance of the assumption of normality, and more than ¾ of observed Groups appear to meet these criteria, the data are to be observed with caution, especially in view of a discrepancy in sample sizes. No violations, however, were observed for the assumption of homogeneity of variance for the Experimental Groups versus the Control Group, with Levene's $F(4,165)=1.13, p=.34$ for the posttest condition. No significant values were obtained in pretest data for factor scores of component ACHIEV for the additional Experimental Groups, with respective pretest Kolmogorov-Smirnov scores $D(36)=0.09, p=.20, D(36)=0.09, p=.20,$ and $D(36)=0.11, p=.20$. Again, however, an Experimental Group EG_{O4A} violated the assumption of normality, although meeting criteria set in Chapter 8.4.1.1., with respective posttest K-S scores $D(23)=0.20, p<.05, D(69)=0.07, p=.20$ and $D(17)=0.14, p=.20$. The assumption of equality in variance was met with Levene's $F(4,175)=0.42, p=.79$ for pretest, and $F(4,165)=1.53, p=.20$ for posttest scores.

The Planned-Comparison was initiated with an analysis of all Experimental Groups combined, where Diversification in a single- a two-fold, a three-fold or a four-fold, or higher, exposure to the treatment condition was observed versus the Control Group. Table 8.3. provides a summarized overview of results for the pretest phase, with Table 8.4. summarizing results of the posttest phase of the experiment. Reference is made to more detailed overviews in Appendix LXVI and Appendix LXVII, respectively.

The Planned-Comparison was performed to test the hypothesis that the Means of the four Experimental Groups, being exposed to the treatment condition, would differ in the posttest condition from the Means of the Control Group, where no differences would appear in the pretest condition, prior to treatment. Within limitations mentioned, the data appear to support the assumption. In the pretest condition no significant differences appeared between the four combined Experimental Groups and the Control Group. On the posttest condition, however, following treatment, a significant difference was observed in Motivation as captured by factor scores of component DEDICAT.

In breaking down the variance accounted for by the model into component parts, the Planned-Comparison was performed to compare the combined Experimental Groups to the Control Group in pretest and posttest settings. No significant differences were observed in the pretest setting, with $t(175)=-.16, p=.87$ *(two-tailed),* $\eta^2=.003,$ as compared to the posttest condition for the combined Experimental Groups after treatment, where a significant difference appeared, $t(165)=2.14, p<.05$ *(two-tailed),* $\eta^2=.037$. As a consequence H_0 was rejected, in favor of H_A, supporting the initial hypothesis *H1,* where it was assumed that addressing the Process of Motivation by means of exposure to the Instruments would lead to a significantly higher Motivation within the combined Experimental Groups as compared to the Control Group that had no exposure.

		Pretest Contrast Results Planned-Comparison				
				B t η^2	95% confid. int. LB UB	
(1)				(2)(3)	(4)	
DEDICAT	Contrast:	$EG_{O3A, O3B, O3C, O3D}$	CG_{O3E}	-.12 -.16 .003		(5)(6)(7)
ACHIEV	Contrast:	$EG_{O3A, O3B, O3C, O3D}$	CG_{O3E}	1.04 1.36 .026		(5)(6)(7)

Notes:
(1) Factorscores
(2) B = Contrast estimate t = t-test statistic of the contrast η^2 = Eta squared of the overall contrast procedure
*(3) * Statistic significant at the 0.05 level (two-tailed)*
*** Statistic significant at the 0.01 level (two-tailed)*
**** Statistic significant at the 0.001 level (two-tailed)*
(4) Range of the 95% confidence interval of the contrast estimate
LB = Lower bound of the interval UB = Upper bound of the interval
(5) EG = Experimental Group CG = Control Group
(6) In the subscript, reference is made to the Experimental and Control Group indications in Fig. 8.1.
(7) No confidence interval estimates are provided in the standard SPSS output routine
For a full overview of contrast results, reference is made to Appendix LXVI

Table 8.3.
Planned-Comparison for One-way independent ANOVA of Experimental and Control Groups on factor scores of components DEDICAT and ACHIEV in Pretest Setting; Contrast Results for the combined Experimental Groups versus the Control Group

In parallel to the findings from Study 12, the analysis revealed no significant differences between groups in factor scores associated to component ACHIEV, with $t(175)=1.36$, $p=.18$ *(two-tailed),* $\eta^2=.026$, for the Planned-Comparison Results on the pretest condition, and $t(165)=-.84$, $p=.40$ *(two-tailed),* $\eta^2=.085$, for Results in the posttest condition.

A further Diversification in Treatment was obtained in a series of additional contrasts capturing the effects of each separate Experimental Group, thus providing insights into the effects of a single, a two-fold, a three-fold and a four-fold exposure to the Instruments enabling a verification of hypotheses *H1A, H1B, H1C* and *H1D*. These results are provided in Table 8.5. and Table 8.6. for pretest and posttest conditions. A full overview of these series of Planned-Comparisons for One-way independent ANOVA's in both pretest and posttest situations is provided in Appendix LXVIII and Appendix LXIX respectively, with associated Contrast Coefficients. Table 8.5 and Table 8.6. are the summarized overviews of these Contrast Tests.

		Posttest Contrast Results Planned-Comparison				
(1)				*B* *t* *η²* *(2)(3)*	*95% confid. int.* *LB* *UB* *(4)*	
DEDICAT	*Contrast:*	$EG_{O4A, O4B, O4C, O4D}$	CG_{O4E}	1.74 2.14 * .037		*(5)(6)(7)*
ACHIEV	*Contrast:*	$EG_{O4A, O4B, O4C, O4D}$	CG_{O4E}	-.61 -.84 .085		*(5)(6)(7)*

Notes:
(1) Factorscores
(2) B = Contrast estimate *t = t-test statistic of the contrast* *η² = Eta squared of the overall contrast procedure*
(3) * *Statistic significant at the 0.05 level (two-tailed)*
** *Statistic significant at the 0.01 level (two-tailed)*
*** *Statistic significant at the 0.001 level (two-tailed)*
(4) Range of the 95% confidence interval of the contrast estimate
LB = Lower bound of the interval *UB = Upper bound of the interval*
(5) EG = Experimental Group *CG = Control Group*
(6) In the subscript, reference is made to the Experimental and Control Group indications in Fig. 8.1.
(7) No confidence interval estimates are provided in the standard SPSS output routine
For a full overview of contrast results, reference is made to Appendix LXVII

Table 8.4.
Planned-Comparison for One-way independent ANOVA of Experimental and Control Groups on factor scores of components DEDICAT and ACHIEV in Posttest Setting; Contrast Results for the combined Experimental Groups versus the Control Group

The Planned-Comparison between the different Experimental Groups and the Control Group at the pretest condition, revealed non-significant results. Respective outcomes for the different comparisons for Experimental Groups EG_{O3A}, EG_{O3B}, EG_{O3C}, and EG_{O3D} versus the Control Group CG_{O3E} were comparable, with *t(175)=.23, p=.82 (two-tailed),* η^2*=.003, t(175)=-.31, p=.75 (two-tailed),* η^2*=.003, t(175)=.34, p=.73 (two-tailed),* η^2*=.003,* and *t(175)=.25, p=.80 (two-tailed),* η^2*=.003* respectively[1]. Confidence intervals associated with these non-significant results all contained zero. On the posttest condition, in line with previous findings, exposure to treatment revealed a gradual effect on Motivation. Referring to Table 8.6, Planned-Comparisons between the various Experimental Groups and the Control Group in the posttest setting obtained following results, with *t(165)=-1.60, p=.11 (two-tailed),* η^2*=.037,* for the first Experimental Group EG_{O4A}, with *t(165)=-1.68, p=.10 (two-tailed),* η^2*=.037,* for the second Experimental Group EG_{O4B}, with *t(165)=-.82, p=.42 (two-tailed),* η^2*=.037,* for the third Experimental Group EG_{O4C},

[1] Eta squared was derived from the combined sum of squares SS_M of the overall contrast, relative to the total sum of squares SS_T, producing overestimated effect sizes for the various contrasts.

and with *t(165)=-2.35, p<.05 (two-tailed),* η^2*=.037* for the fourth Experimental Group EG_{O4D}, in line with outcomes previously registered for the One-way independent ANOVA where both Groups EG_{O4D} and CG_{O4E} were observed earlier. Given that the outcome of the comparison between both Groups appeared to be significant, the confidence interval did not contain zero. In addition, however, it is noted that the lower limit of the interval (*-1.24*) appeared to be about 10 times larger than the upper limit (*-.11*), and the confidence interval therefore contained values that were rather distinct from each other.

A Planned-Comparison for factor scores associated with component ACHIEV, revealed no significant outcomes on the pretest condition, with respective scores for Experimental Groups EG_{O3A}, EG_{O3B}, EG_{O3C}, and EG_{O3D} versus Control Group CG_{O3E}, as obtained in the analysis: *t(175)=-1.40, p=.16 (two-tailed),* η^2*=.026, t(175)=-.39, p=.70 (two-tailed),* η^2*=.026, t(175)=-.65, p=.52 (two-tailed),* η^2*=.026,* and *t(175)=-1.86, p=.07 (two-tailed),* η^2*=.026* respectively, with confidence intervals all containing zero[1]. Referring to Table 8.6, a remarkable effect was observed for Experimental Group EG_{O4A} in contrast to the Control Group CG_{O4E}, indicating a significant effect of treatment after a single exposure to the Instruments, with *t(165)=2.77, p<.01 (two-tailed),* η^2*=.085.* The effect could not be observed in subsequent Groups following exposure to a two-fold, a three-fold and a four-fold treatment in respective Experimental Groups EG_{O4B}, EG_{O4C} and EG_{O4D} versus Control Group CG_{O4E}, with *t(165)=-.08, p=.94 (two-tailed),* η^2*=.085, t(165)=.95, p=.34 (two-tailed),* η^2*=.085,* and *t(165)=-1.33, p=.19 (two-tailed),* η^2*=.085.*

The Planned-Comparison was concluded with a polynomial contrast to assess if in results obtained, a trend could be observed where increased exposure would lead to increased effects on the Process of Motivation. The contrast tested for trends in the data in its most basic form i.e. for a linear trend with a proportionate change in the value of the dependent variable across the four Experimental Groups. A significant linear trend could be observed, F_{LIN}*(1,165)=4.19, p<.05,* η^2*=.037*, indicating that as the treatment condition and exposure to the Instruments increased, Motivation, as captured by factor score component DEDICAT, increased proportionally[2]. These findings were obtained in the posttest condition; in the pretest condition no trends were observed, F_{LIN} *(1,175)=0.07, p=.79,* η^2*=.003*.

[1] Eta squared was derived from the combined sum of squares SS_M of the overall contrast, relative to the total sum of squares SS_T, producing overestimated effect sizes for the various contrasts.

[2] In the unbalanced design with unequal sample sizes in the posttest condition, the analysis was computed as a weighted linear trend.

			Pretest Contrast Results Planned-Comparison						
			M (SD) N		M (SD) N	B t η^2	95% confid. int. LB	UB	
(1)			(2)		(2)	(3)(4)	(5)		
DEDICAT	Contrast:	EG_{O3A}	-0.20 (0.97) 36	CG_{O3E}	-0.26 (0.79) 36	.05 .23 .003	-.40	.50	(6)(7)
	Contrast:	EG_{O3B}	-0.33 (0.90) 36	CG_{O3E}	-0.26 (0.79) 36	-.07 -.31 .003	-.52	.38	(6)(7)
	Contrast:	EG_{O3C}	-0.18 (1.15) 36	CG_{O3E}	-0.26 (0.79) 36	.08 .34 .003	-.37	.53	(6)(7)
	Contrast:	EG_{O3D}	-0.20 (0.97) 36	CG_{O3E}	-0.26 (0.79) 36	.06 .25 .003	-.39	.50	(6)(7)
ACHIEV	Contrast:	EG_{O3A}	-0.38 (0.93) 36	CG_{O3E}	-0.04 (1.06) 36	-.34 -1.40 .026	-.82	.14	(6)(7)
	Contrast:	EG_{O3B}	-0.13 (0.99) 36	CG_{O3E}	-0.04 (1.06) 36	-.09 -.39 .026	-.57	.38	(6)(7)
	Contrast:	EG_{O3C}	-0.20 (1.10) 36	CG_{O3E}	-0.04 (1.06) 36	-.16 -.65 .026	-.64	.32	(6)(7)
	Contrast:	EG_{O3D}	-0.49 (1.05) 36	CG_{O3E}	-0.04 (1.06) 36	-.45 -1.86 .026	-.93	.03	(6)(7)

Notes:
(1) Factorscores
(2) M = Mean SD = Standard deviation N = Sample size
(3) B = Contrast estimate t = t-test statistic of the contrast η^2 = Eta squared of the overall contrast procedure
(4) $*$ Statistic significant at the 0.05 level (two-tailed)
$**$ Statistic significant at the 0.01 level (two-tailed)
$***$ Statistic significant at the 0.001 level (two-tailed)
(5) Range of the 95% confidence interval of the contrast estimate
LB = Lower bound of the interval UB = Upper bound of the interval
(6) EG = Experimental Group CG = Control Group
(7) In the subscript, reference is made to the Experimental and Control Group indications in Fig. 8.1.
For a full overview of contrast results, reference is made to Appendix LXVIII

Table 8.5.
Planned-Comparison for One-way independent ANOVA of Experimental and Control Groups on factor scores of components DEDICAT and ACHIEV in Pretest Setting; A Summary of Main Contrast Results

			Posttest Contrast Results Planned-Comparison						
			M (SD) N		M (SD) N	B t η^2	95% confid. int. LB	UB	
(1)			(2)		(2)	(3)(4)	(5)		
DEDICAT	*Contrast:*	EG_{O4A}	-0.27 (1.06) 23	CG_{O4E}	0.18 (1.03) 39	-.45 -1.60 .037	-1.01	.11	*(6)(7)*
	Contrast:	EG_{O4B}	-0.18 (1.13) 69	CG_{O4E}	0.18 (1.03) 39	-.36 -1.68 .037	-.79	.06	*(6)(7)*
	Contrast:	EG_{O4C}	-0.07 (0.98) 17	CG_{O4E}	0.18 (1.03) 39	-.26 -.82 .037	-.87	.36	*(6)(7)*
	Contrast:	EG_{O4D}	-0.49 (1.04) 22	CG_{O4E}	0.18 (1.03) 39	-.68 -2.35 * .037	-1.24	-.11	*(6)(7)*
ACHIEV	*Contrast:*	EG_{O4A}	0.57 (0.80) 23	CG_{O4E}	-0.14 (0.86) 39	.70 2.77 ** .085	.20	1.20	*(6)(7)*
	Contrast:	EG_{O4B}	-0.15 (1.06) 69	CG_{O4E}	-0.14 (0.86) 39	-.02 -.08 .085	-.40	.37	*(6)(7)*
	Contrast:	EG_{O4C}	0.13 (1.10) 17	CG_{O4E}	-0.14 (0.86) 39	.27 .95 .085	-.29	.82	*(6)(7)*
	Contrast:	EG_{O4D}	-0.48 (0.87) 22	CG_{O4E}	-0.14 (0.86) 39	-.34 -1.33 .085	-.85	.17	*(6)(7)*

Notes:
(1) Factorscores
(2) M = Mean SD = Standard deviation N = Sample size
(3) B = Contrast estimate t = t-test statistic of the contrast η^2 = Eta squared of the overall contrast procedure
*(4) * Statistic significant at the 0.05 level (two-tailed)*
*** Statistic significant at the 0.01 level (two-tailed)*
*** Statistic significant at the 0.001 level (two-tailed)*
(5) Range of the 95% confidence interval of the contrast estimate
LB = Lower bound of the interval UB = Upper bound of the interval
(6) EG = Experimental Group CG = Control Group
(7) In the subscript, reference is made to the Experimental and Control Group indications in Fig. 8.1.
For a full overview of contrast results, reference is made to Appendix LXIX

Table 8.6.
Planned-Comparison for One-way independent ANOVA of Experimental and Control Groups on factor scores of components DEDICAT and ACHIEV in Posttest Setting; A Summary of Main Contrast Results

No linear trends were obtained in analyses of factor score component ACHIEV, in both pretest, F_{LIN} *(1,175)=1.77, p=.19,* η^2*=.026*, and posttest settings, F_{LIN} *(1,165)=2.21, p=.14,* η^2*=.085*[1].

A Planned-Comparison for One-way independent ANOVA was performed, allowing for an analysis with Diversification in Treatment Groups. The Planned-Comparison was aimed at assessing effects of treatment in three separate analyses. In a first analysis, the Planned-Comparison was performed to assess the effects of all Experimental Groups combined in relation to a Control Group with no exposure to treatment. First results revealed a significant difference in the posttest condition, after treatment, as compared to the pretest condition. In a second analysis, these findings could be further diversified, isolating the effects of each separate Experimental Group, thus providing insights into the effects of a single, a two-fold, a three-fold and a four-fold, or higher, exposure to the Instruments. In line with previous findings, exposure to treatment revealed a gradual effect on Motivation, with a significant effect after a four-fold exposure to the treatment condition, thus providing support for hypothesis H1D, as defined Chapter 8.4.3. In a final analysis, these findings were confirmed in a Planned-Comparison where a significant linear trend could be observed, indicating that as the treatment condition and exposure to the Instruments increased, Motivation increased proportionally.

In summary, then, it appears, a confirmation could be found for hypothesis H1D, where a four-fold exposure to a structured interview, following training by the Actor-Intervener, was assumed to have a significant positive impact on Motivation as captured by component DEDICAT in analyses of distinct Experimental Groups as compared to a Control Group that had no exposure to treatment, where effects were assumed to progress following a linear trend.

In a third and final analysis, a Two-way independent factorial ANOVA was to evaluate how pre- and posttest variables interact and what effects these interactions have on the observed dependent variables. A number of factorial designs were chosen in order to assess the validity of previous findings indicating effects in treatment emerging after exposure to treatment in general, after exposure to a three-fold treatment condition in parallel to Study 12, and after exposure to four or more consecutive treatment conditions, all within restricted periods of time. In each design, the Experimental and Control Groups were observed on a factor Group (Experimental Group and Control Group) over a factor Time-of-Measure (pretest condition and posttest condition). The analysis was to be performed of the model in general, of its main effects, and of the interaction between both independent variables, with special emphasis on findings for the model in general and for the interaction.

[1] *Ibid*.

In observing all Groups involved, i.e. the combined Experimental Groups versus the Control Group in both pretest and posttest settings, a non-significant effect for the model in general was obtained, with *F(3, 346)=1.95, p=.12,* η^2*=.017,* indicating that exposure to treatment per se, is not a sufficient condition for an increased Motivation to occur, as captured by factor score component DEDICAT. In observing the effects of more frequent exposures, the factorial ANOVA was restricted to the Experimental Groups with at least a three-fold exposure to the treatment condition, in parallel to Study 12, i.e. EG_{O3C} and EG_{O3D} in pretest setting, EG_{O4C} and EG_{O4D} in posttest setting, versus CG_{O3E} and CG_{O4E}, respectively. In contrast with findings from Study 12, non-significant results were obtained, with *F(3, 182)=1.94, p=.13,* η^2*=.031*. Significant results emerged in the factorial ANOVA of Experimental Groups with a four-fold exposure, i.e. EG_{O3D} in pretest setting and EG_{O4D} in posttest setting, versus CG_{O3E} and CG_{O4E}, respectively. In parallel to previous findings in the introductory One-way independent ANOVA, a significant effect for the model in general was obtained, with *F(3, 129)=2.69, p<.05,* η^2*=.059.* Variance explained by either a factor Group, or a factor Time-of-Measure revealed no noticeable differences, with a non-significant main effect of Group on Motivation as captured by component DEDICAT, *F(1, 129)=3.30, p=.07,* η^2*=.025,* and a non-significant main effect of Time-of-Measure on Motivation, *F(1, 129)=0.18, p=.67,* η^2*=.001*. More relevant, however, to the analysis of pretest and posttest related effects between Treatment Group and non-Treatment Group, a significant interaction effect was observed between Group and Time-of-Measure on Motivation, *F(1, 129)=4.62, p<.05,* η^2*=.035.*

To provide additional insights into these and previous results, a visualized overview is presented in Fig. 8.2., of Mean factor scores of component DEDICAT on pre- and posttest settings, for both the Experimental and Control Groups. The overview reveals both an important decline in Motivation, as captured by factor score DEDICAT, between pretest and posttest Time-of-Measure, whereas these levels appear to have significantly increased in the Experimental Group following a four-fold exposure to the Instrumentation and measured between pre- and posttest condition. Intermediate effects emerge for the Experimental Groups with a single, a two-fold and a three-fold exposure to treatment in the posttest condition, where mean-values appear to have remained at equivalent levels of the posttest condition. The extensive increase in Motivation as captured by factor score DEDICAT, the intermediate position of remaining Treatment Groups and the decline in Motivation for the non-Treatment Group in posttest versus pretest settings appears to be accountable for these results, that are thus in agreement with our previous findings.

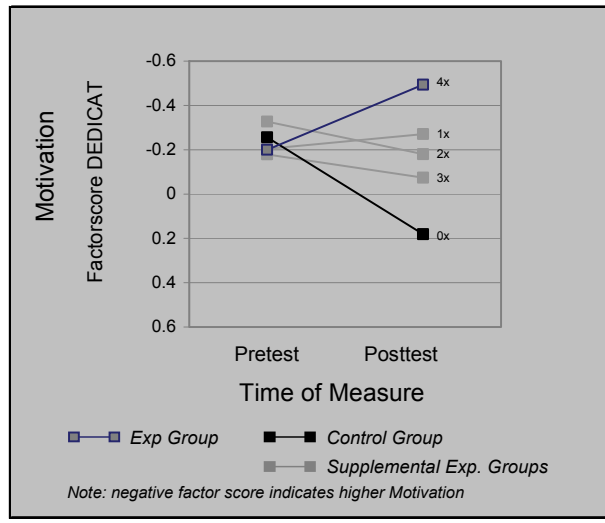

Fig 8.2.
A Visualized Overview of the Effects of Treatment on Motivation as Captured in Factor Score DEDICAT for Experimental and Control Groups in Pretest and Posttest Settings.

No significant results were obtained for factor score ACHIEV on pretest and posttest conditions, nor for the model in general, with $F(3, 346)=1.68$, $p=.17$, $\eta^2=.014$, nor for analysis of the Experimental Groups with at least a three-fold exposure, $F(3, 182)=0.82$, $p=.49$, $\eta^2=.013$, nor for the Experimental Groups with a four-fold exposure, $F(3, 129)=1.87$, $p=.14$, $\eta^2=.042$[1].

A visualized overview summarizing effects for factor score ACHIEV on pretest and posttest settings is provided in Fig. 8.3. The overview reveals a moderately scattered series of factor scores capturing component ACHIEV at the pretest condition, progressing into a heavily distributed series at the posttest condition. Within these figures no apparent and meaningful arrangement or trend can be observed, where Control and principal Experimental Groups, together with the

[1] However, a significant main effect emerged for factor Group, $F(1, 129)=5.24$, $p<.05$, $\eta^2=.039$. No significant effects appeared for factor Time-of-Measure, $F(1, 129)=0.06$, $p=.81$, $\eta^2=.000$, nor for the interaction between both variables, $F(1, 129)=0.10$, $p=.75$, $\eta^2=.001$.

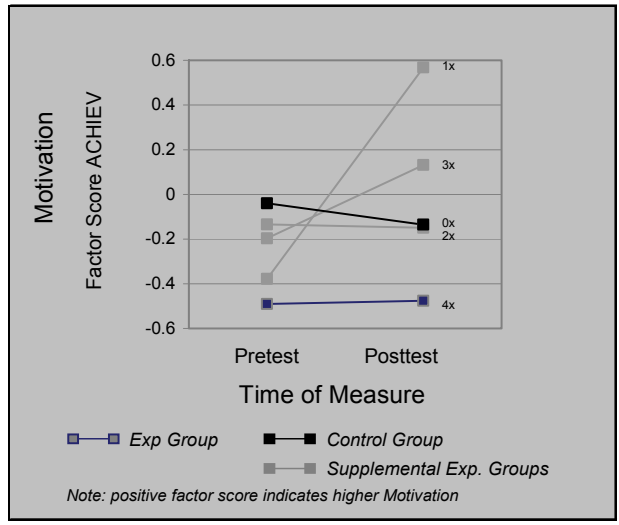

Fig 8.3.
A Visualized Overview of the Effects of Treatment on Motivation as Captured in Factor Score ACHIEV for Experimental and Control Groups in Pretest and Posttest Settings.

Experimental Group with a two-fold experimental exposure, reveal comparable values on pretest and posttest settings. In addition, however, in the supplemental Experimental Groups, the Groups with a single and a three-fold experimental exposure appear to have increased in the posttest condition, with the former Group reaching even a significant level as compared to the pretest condition.

Summarizing and evaluating the results from these three analyses, it appears the Study provides further evidence for the assumption defined in Chapter 8.4., that a causal relation exists between an application of the Instruments and a successful addressing of the Process of Motivation as stated in hypothesis H1D, defined in Chapter 8.4.3.

Given the principal hypothesis H1D was considered valid when: $DEDICAT_{O4D} < DEDICAT_{O4E}$ *, while:* $DEDICAT_{O3D} = DEDICAT_{O3E}$ *, the data appear to confirm these assumptions*[1]*, where a shift in levels of Motivation seems to have occurred between the pretest and posttest settings, with a sharp decline in Motivation in the Control Group as compared to the Experimental Group where initial levels of Motivation increased. Given these results are likely to reflect an effect of the*

[1] A *lower* factor score for DEDICAT was considered to be indicative of a *higher* Motivation.

experimental treatment and are unlikely to have arisen by chance, H_0 is to be rejected where it was assumed $DEDICAT_{O4D} >= DEDICAT_{O4E}$, while $DEDICAT_{O3D} = DEDICAT_{O3E}$.

Furthermore, the data also appear to confirm the occurrence of a trend, with $Trend\_DEDICAT_{O4A, O4B, O4C, O4D} < DEDICAT_{O4E}$, while: $Trend\_DEDICAT_{O3A, O3B, O3C, O3D} = DEDICAT_{O3E}$.

3. Discussion

In Experimental Study 13 aimed at null hypothesis significance testing, the Comparative Analyses were performed in three phases.

The first phase consisted of an introductory One-way independent ANOVA, testing the principal Experimental and Control Groups in both pretest and posttest settings, where a significant effect was observed on levels of Motivation, $F(1, 59)=5.97, p<.05, \eta^2=.092,$ on the posttest condition, as compared to the pretest condition, $F(1, 70)=0.07, p=.79, \eta^2=.001$.

In a second phase, a Planned-Comparison was performed to assess effects of Diversification in Treatment Groups. Effects were obtained after a four-fold exposure to the treatment condition, with $t(165)=-2.35, p<.05$ (two-tailed), $\eta^2=.037$ registered on the posttest condition, as compared to $t(175)=.25, p=.80$ (two-tailed), $\eta^2=.003$ on the pretest condition.

In a third and final analysis, a Two-way independent factorial ANOVA was performed to evaluate the effects of pre- and posttest variables on the observed dependent variables, especially on factor score component DEDICAT, and to evaluate how these variables interact. A significant effect for the model in general was obtained in the factorial ANOVA of Experimental Groups with at least a four-fold exposure, with $F(3, 129)=2.69, p<.05, \eta^2=.059,$ with a significant interaction effect between Group and Time-of-Measure on Motivation as captured by component DEDICAT, $F(1, 129)=4.62, p<.05, \eta^2=.035.$

These findings suggest that a significant difference in Motivation occurred within the Experimental Group after exposure to at least four sessions of a structured interview within a limited time frame, following training by the Actor-Intervener, as compared to Control Groups that had no exposure. Effects of treatment were positively related to Motivation as captured by component factor score DEDICAT, whereas effects on component factor score ACHIEV appeared to be non-related. As a principal outcome, then, it was concluded that Study 13 did provide evidence for the assumption defined in Chapter 8.4., that a causal relation exists between an application of Instruments and a successful addressing of the Process of Motivation as stated in hypothesis *H1D*, defined in Chapter 8.4.3.

Despite these findings, however, a number of important restricting observations are to be made, concerning internal, external, construct and statistical conclusion validity, as the four main criteria used in defining a choice in experimental design in the original research, with reference to Appendix LXII, Section B.

First, a number of potential threats to internal validity are to be considered. Bias occurring as a result of sampling within a single company, where company-related characteristics could have unintentionally affected treatment results, needs careful consideration. Moreover, interference from company regulations and policies with treatment outcomes, and effects resulting from various events occurring during the pretest posttest period could have been threats to internal validity[1].

External validity concerns inferences about the extent to which a causal relationship holds over variations of the experiment and could be generalized over different persons, settings, different treatments and measurement variables. The more diverse the various comparison Groups, the higher the probability of an adequate extrapolation of research findings and a generalization of the observed causal relationships to other settings. The chosen approach in Study 13, avoiding a company-departmental assignment of Experimental or Control Groups, has contributed to avoid possible threats to external validity. Nonetheless, within the company setting, variations in work content and work environment could have affected results, although these variations are expected to have been compensated to a considerable extent by avoiding a departmental allocation of Experimental and Control Groups[2].

Threats to construct validity appear to be prominent within the chosen experimental design. The operationalization of Instruments into a specific training setting and a structured interview has implications that affect construct validity. Although the chosen design in Study 13 allows for a pluriform deployment of the structured interview by several Actor-Interveners, the training setting performed by a single trainer, might have affected the outcome results. On the same grounds, observation by means of the HF-2.01 questionnaire proposed in Chapter 5.3., enabled an adequate measurement of effects as concluded Chapter 5.5.3., but the uniform approach could have had comparable, unintended effects on the outcomes of the experiment. In the non-random procedural approach, subjects responding to being accepted to or excluded from treatment, or effects resulting from participant's expectations and perceptions of the experimental treatment, or effects resulting from introducing a new Instrumentation in addressing Motivation, are issues that remain to be addressed in subsequent research within a different setting. Although a

[1] In observing potential threats to internal validity, these various issues are identified, respectively, as: Interactive Effects of Threats to Internal Validity and History, with reference to Shadish, Cook & Campbell (2002).

[2] Referring to observations of various threats to external validity, the threat is identified as: Context-Dependent Mediation, with reference to Shadish, Cook & Campbell (2002).

Diversification in Treatment allowed for an accurate assessment of these effects, with observations differentiated according to frequencies of exposure to the treatment condition, construct validity issues call for additional measures to supplement the present research[1].

A number of issues concerning statistical conclusion validity remain. Limitations as a result of unbalanced and relative smaller sample sizes, and the implications it had on the conclusions drawn from the data results, are to be addressed in further research. Furthermore, the observed levels of η^2 in Study 13, as a slightly biased, alternative measure to the estimate of effect size ω^2, remained at a moderate level[2]. Given that the effect size is intrinsically linked not only to the sample size, but also to the probability level α, and the statistical power of the test, it was deduced earlier, that at a given α, the small effect size affects the statistical power, hence the tenability of conclusions inferred from the data. Furthermore, as an issue affecting statistical conclusion validity, not all assumptions underlying the statistical tools that were used, could be met. In a number of observations, the assumption of normality was violated, although still within criteria set in Chapter 8.4.1.1., where at least ¾ of observed Groups appeared to meet these criteria. In addition, it was noted that the confidence interval of the contrast estimate in the Planned-Comparison between the Experimental Group EG_{O4D} and the Control Group CG_{O4E} at the posttest condition, that was indicative of an important, significant result in the Study, was nonetheless rather large and therefore contained values that were rather distinct from each other. As a result, the exact effects of the treatment condition, although significant, would need further observation through additional research. A third and final threat to conclusion validity, was a potential weakness in the treatment implementation that allowed for an individualized approach, after the Actor-Intervener had gained extensive experience with the structured format of the interview, possibly affecting a correct procedure, and a limited opportunity for assessing these effects, as a consequence of the strict confidentiality adhered to in the interview[3].

To improve validation, the analysis in the original research referred to in Mennes (2016, *in press*), was extended with Study 14, replicating the quasi-experimental setting, and aimed especially at increasing both effect size and statistical power.

[1] These threats to construct validity are identified as, respectively: Mono-Operation Bias, Mono-Method Bias, Reactive Self-Report Changes, Reactivity to the Experimental Situation and Novelty and Disruption Effects, with reference to Shadish, Cook & Campbell (2002).

[2] The effect size estimates η^2 in Study 13 generally ranged between *.04* and *.09*. According to Cohen 1988, 1992 these effect size estimates (corresponding to *r=.2* and *r=.3)* can be defined as 'a small to medium effect'.

[3] These threats to statistical conclusion validity are identified as Low Statistical Power, Violated Assumptions of Statistical Tests, and Unreliability of Treatment Implementation, with reference to Shadish, Cook & Campbell (2002).

4. Conclusion

Although a number of limitations remained, affecting validity in assessing the effects of treatment, Study 13 provided evidence for a cause-and-effect relation to exist between an application of Instruments and a successful Management of the Process of Motivation.

In three comparable phases to the ones performed in Study 12, hypotheses defined in Chapter 8.4.3., were found to be confirmed in Study 13.

In a pretest-posttest design, controlling for a number of threats to validity, an important decline in Motivation seems to have occurred, as captured by factor score DEDICAT, between pretest and posttest Time-of-Measure, whereas these levels appear to have significantly increased in the Experimental Group with a four-fold exposure to the Instrumentation in the posttest condition. Intermediate effects emerged for the Experimental Groups with a single, a two-fold and a three-fold exposure to treatment in the posttest condition, revealing a trend where increased exposure led to increased Motivation. It was assumed that these findings were an effect of the experimental manipulation and were unlikely to have arisen by chance. As a principal result of Study 13, Hypothesis H1D was therefore assumed valid, confirming the assumption that addressing the Process of Motivation by means of an Instrumentation consisting of a training setting for the Actor-Intervener followed by a four-fold exposure of the Individual to a structured interview, leads to a significantly higher Motivation within the Experimental Group as compared to a Control Group that had no such exposure.

8.5.3. Study 14: Comparative Analysis Dependent Measures *Diversification in Treatment Groups*

Referring to Mennes (2016*, in press*), notably Chapter 14.5.3., Study 14 was the third of a series aimed at verifying the assumption of a cause-and-effect relation between an application of Instruments and a successful addressing of the Process of Motivation. Study 14 aimed at providing a supplemental evidence for the findings from Study 13, in a dependent research design that would reduce the unsystematic variation created by random factors, thus enabling greater power to detect effects, which was considered a major deficit of Study 13, as briefly mentioned in Chapter 8.5.2.3. As stated Chapter 8.4., a summary is provided, supplementing the findings from Study 13.

In the Comparative Analysis three approaches were taken:

In an introductory Two-way mixed design ANOVA, the Experimental and Control Groups were observed on a between-subjects factor Group (Experimental Groups and Control Group) over a within-subjects factor Time-of-Measure (pretest condition and posttest condition), to test if differences could be observed between the various Groups over time. There was a non-significant between-subjects main effect for Group, $F(4,61)=0.02$, $p=.99$, $\eta_p^2=.001$, and a non-significant within-subjects main effect for Time-of-Measure, $F(1,61)=0.04$, $p=.84$, $\eta_p^2=.001$. The level of Motivation, as captured by factor score component DEDICAT was comparable across Groups when

one ignores the time at which DEDICAT was measured, and no differences appeared in Motivation levels over time if exposure to treatment and differences between the various Groups were ignored. The interaction effect of Group with Time-of-Measure, however, provided a significant effect, $F(4,61)=4.34,\ p<.01,\ \eta_p^2=.221,$ indicating that the observed change in Motivation over time, as captured by DEDICAT, appeared to be different amongst the various Groups observed.

Subsequently, with these first observations that significant differences in Motivation occurred within the various Groups over time, repeated-measures MANOVA, with simple main effects analyses were performed, testing which of the various Experimental and Control Groups differed at pretest and posttest conditions. In assessing the effects of a factor Time-of-Measure on pre- and posttest conditions at each distinct level of treatment, it appeared a repeated-measures MANOVA, with simple main effects analyses produced mostly non-significant results within Experimental Groups at various levels of exposure to treatment, whereas pronounced differences were obtained within the Control Group on factor score component DEDICAT. Using Pillai's trace, there was a non-significant effect of time for the Experimental Group with a single exposure to treatment, as measured before and after the experiment, $V=0.04,\ F(1,61)=2.68,\ p=.11,\ \eta_p^2=.034.$ Same results appeared, for remaining Experimental Groups. Using Pillai's trace, the simple main effects analyses, produced for the Experimental Group with a two-fold exposure to treatment, $V=0.05,\ F(1,61)=3.24,\ p=.08,\ \eta_p^2=.041,$ for the Experimental Group with a three-fold exposure to treatment, $V=0.00,\ F(1,61)=0.13,\ p=.72,\ \eta_p^2=.002,$ and for the Experimental Group with a four-fold, or higher, exposure to treatment, $V=0.00,\ F(1,61)=0.08,\ p=.78,\ \eta_p^2=.001.$ In contrast, however, the simple main effects analysis of time on Motivation within the Control Group revealed a significant difference at $p<.001$ on DEDICAT, $V=0.16,\ F(1,61)=11.24,\ p<.001,\ \eta_p^2=.144.$ These data, then, appeared to be indicative of a significant change in Motivation within the Control Group, as opposed to relatively unaltered levels of Motivation in the various Experimental Groups.

To further evaluate these differences between Experimental Groups and Control Groups, Repeated-measures planned-comparison MANOVA analyses were performed of a factor Time-of-Measure within a factor Group, where distinct Experimental Groups were compared to the Control Group on effects over time, between pretest and posttest conditions. Respective outcomes for the different comparisons in time of the Experimental Groups with a single, a two-fold and a three-fold exposure to treatment on factor score component DEDICAT, versus the Control Group provided significant results, with $t(61)=3.24,\ p<.01$ *(two-tailed),* $\eta_p^2=.147,\ t(61)=3.77,\ p<.001$ *(two-tailed),* $\eta_p^2=.189,$ and $t(61)=2.10,\ p<.05$ *(two-tailed),* $\eta_p^2=.068,$ respectively. The Experimental Group with a four-fold exposure to treatment, however, failed to reach significance in comparison to the Control Group with $t(61)=1.84,\ p=.07$ *(two-tailed),* $\eta_p^2=.052.$ A further analysis suggested, however, that inadequate sampling appeared to have affected these results. Following recommendations from literature, the Experimental Groups with a three-fold and four-fold exposure to treatment, both with sample sizes below n=12, were merged into a single Experimental Group of subjects having had a three-fold exposure, or more, to the treatment condition, producing significant results versus the Control Group, with $t(61)=2.40,\ p<.05$ *(two-tailed),* $\eta_p^2=.085.$

In accordance with previous findings, no significant results were obtained in the various analyses for factor scores associated with component ACHIEV.

From the analysis, then, it appeared the various Treatment Groups differed in comparison to the non-Treatment Group in effects over time, as implied from the findings obtained from the previous simple effects analyses, thus re-confirming earlier findings from Study 12 and Study 13.

8.6. Summary

Chapter 8., aimed at a validation of specific Instruments enabling Intrinsic Intervention Competencies within an Intrinsic Modality in Management of Motivation.

The validation of Instruments was to provide an indication for a causal relation to exist between application of Instruments defined as a training setting and a structured interview, and the occurrence of a successful Intervention within the Process of Motivation.

A brief synopsis was provided of Study 12, Chapter 8.5.1., referring to the original research Project detailed in Mennes (2016, in press), notably Chapter 14.5.1.

Study 13, Chapter 8.5.2., consisted of a Comparative Analysis Independent Measures to provide a Diversification in Treatment Groups assessing the effects of a single, a two-fold, a three-fold and a four-fold, or higher, exposure to the treatment condition. Confirmation was found for hypothesis H1D, defined Chapter 8.4.3., which assumed that addressing the Process of Motivation by means of a four-fold, or higher, exposure to the Instruments, would lead to a significantly higher Motivation within the Experimental Group as compared to Control Groups that would have had no exposure.

The Comparative Analysis was performed in three phases:

- *In an introductory One-way independent ANOVA, testing a principal Experimental Group versus Control Group in both pretest and posttest settings, there was a significant effect of the treatment condition on Motivation as captured by factor score component DEDICAT, $F(1, 59)=5.97$, $p<.05$, $\eta^2=.092$, on the posttest condition, as compared to $F(1, 70)=0.07$, $p=.79$, $\eta^2=.001$, on the pretest condition.*
- *Subsequently, a Planned-Comparison for One-way independent ANOVA was performed, allowing for an analysis with Diversification in Treatment Groups. The Planned-Comparison was performed to assess effects of treatment in three analyses:*
  - *A Planned-Comparison for the combined Experimental Groups versus the Control Group, revealed a significant difference for the Experimental Groups after treatment, with $t(165)=2.14$, $p<.05$ (two-tailed), $\eta^2=.037$, as captured by factor score component DEDICAT, whereas no significant differences appeared in the pretest setting, with $t(175)=-.16$, $p=.87$ (two-tailed), $\eta^2=.003$.*
  - *A Planned-Comparison for the separate Experimental Groups versus a Control Group, revealed a gradual effect on Motivation. Planned-Comparisons between the various Experimental Groups and the Control Group in the posttest setting produced following results, with $t(165)=-1.60$, $p=.11$ (two-tailed), $\eta^2=.037$ for a single exposure to treatment, with $t(165)=-1.68$, $p=.10$ (two-tailed), $\eta^2=.037$ for a two-fold exposure, with $t(165)=-.82$, $p=.42$ (two-tailed), $\eta^2=.037$ for a three-fold exposure, and with $t(165)=-2.35$, $p<.05$ (two-tailed), $\eta^2=.037$ for a four-fold or higher*

exposure to treatment respectively, as opposed to non-significant results in the Planned Comparison in the pretest condition, with respective outcomes for the different comparisons t(175)=.23, p=.82 (two-tailed), η^2=.003, t(175)=-.31, p=.75 (two-tailed), η^2=.003, t(175)=.34, p=.73 (two-tailed), η^2=.003, and t(175)=.25, p=.80 (two-tailed), η^2=.003.

- *Given the sequential order in which the Treatment Groups could be observed, a Trend-analysis using polynomial contrasts was provided, restricted to a basic linear trend in the value of the dependent variable across the four Treatment categories. A significant linear trend could be observed on posttest, F_{LIN} (1,165)=4.19, p<.05, η^2=.037, as opposed to F_{LIN} (1,175)=0.07, p=.79, η^2=.003 on pretest, indicating that as the treatment condition and exposure to the Instruments increased, Motivation, as captured by factor score component DEDICAT, increased proportionally.*

- *Finally, in a third and final phase of the Comparative Analysis, a Two-way independent factorial ANOVA was performed, evaluating the interaction of pre- and posttest variables and the effects of these interactions on the observed factor score component DEDICAT, capturing Motivation. A non-significant effect for the model in general was obtained, with F(3, 346)=1.95, p=.12, η^2=.017, indicating that exposure to treatment per se, was not a sufficient condition for an increased Motivation to occur. In observing the effects of more frequent exposures, significant results emerged in the factorial ANOVA of Experimental Groups with at least a four-fold exposure, where a significant effect for the model in general was obtained, with F(3, 129)=2.69, p<.05, η^2=.059. Relevant to the analysis of pretest and posttest related effects between Treatment Group and non-Treatment Group, was a significant interaction effect observed between Experimental and Control Groups on pretest and posttest Time-of-Measure in the level of Motivation, F(1, 129)=4.62, p<.05, η^2=.035.*

Again, no significant results were obtained in the various analyses for factor scores associated with component ACHIEV on pretest and posttest conditions.

Finally, a brief synopsis was provided of Study 14, Chapter 8.5.3., referring to the original research Project detailed in Mennes (2016, in press), notably Chapter 14.5.3.

Following the Problem Statement defined in Chapter 2.5., then, the empirical research produced evidence for a causal relation to exist between isolated constructs operationalizing the Process of Motivation and concepts operationalizing the exemplary Instrumentation.

Providing evidence for these exemplary Instruments is the key finding of the fourth empirical research of this dissertation.

In addition, these findings provide secondary empirical evidence in support of the Model of Motivation, from which these exemplary Instruments were derived.