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PREFACE

This early edition of the 17th Facet Theory Conference Proceedings contains the written versions of about a half of the contributions proposed for the forthcoming conference rescheduled to take place in Prague in July 2021. With the submission of the remaining papers, a fuller proceedings publication may well be considered.

With the advent of the coronavirus pandemic, the conference, planned for July 2020, was postponed by a year to July 2021, with the hope that it will be possible to hold it at that time. But since many good papers had already been in preparation, we decide to offer their authors an outlet in the form of this early edition of the anticipated proceedings. We hope this publication will serve to maintain continuous communication among conference participants until we meet.

Some papers in this collection discuss general subjects such as the nature of Facet Theory, the role of facets in partitioning MDS spaces, and the relationship between levels of variables and their SSA structure. Other papers enrich and deepen research areas that have been treated by Facet Theory, such as values, motivation and interpersonal relationships. But most papers in this collection apply Facet Theory to new research domains such as gambling, curiosity and body image. We trust the reader will find these contributions interesting and stimulating.

Editorial intervention in this collection of papers has been kept to a minimum: The papers, accepted on the basis of their relevance to Facet Theory, are presented essentially as submitted by their author or authors. Dictated by time and budget constraints, this editorial policy may have its advantage: The resulting collection faithfully reflects the current state of proficiency and sophistication in the understanding and application of Facet Theory by contributors.

We would like to thank all prospective conference participants for their collaboration, and especially those who responded to our invitation to submit their papers for this publication.

The Program Committee:

Samuel Shye, Chair
Esther Solomon
Ingwer Borg

December 2020

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THE ESSENCE OF FACET THEORY: A UNIFIED VIEW OF FACETED MULTIVARIATE RESEARCH METHODS

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ABSTRACT

Research design methods and data analytic procedures of Facet Theory are reviewed and classified in two ways: the kind of entities analyzed (variables or individuals) and the kind of representation space used (similarity or partial order). A unifying principle is presented for all Facet Theoretical procedures namely, in terms of the search for a 1-1 correspondence between definitional classifications of the analyzed entities and empirical classifications of points in a uniform-texture of data representation spaces. The article sheds light on Facet Theory as a potent metatheory for promoting scientific reproducibility.

INTRODUCTION

Facet Theory (FT) is a *metatheory* for the multivariate behavioral sciences; that is, Facet Theory is a theory about how theories and measurements in behavioral research can be advanced. More specifically, Louis Guttman, the founder of Facet Theory, has succinctly defined Facet Theory as "The general hypothesis that, in the long run, an optimal strategy for developing laws is the specification of certain formal roles for the facets in a mapping sentence…" (See Shye, 1978, p.6). Indeed, over the years, Facet Theory has proved to be a powerful research strategy for discovering scientific lawfulness and reproducible results. This article explains and expands on Guttman's definition of Facet Theory, and briefly describes illustrative examples.

A *facet* (in Facet Theory) is simply a classification. Among the objects that are classified in Facet Theory are stimuli such as questionnaire or test items; and respondents to such stimuli. A *content-facet* is a set of classes by which *questionnaire or test items,* may be classified. A *range-facet* is a pre-specified set of possible responses to questionnaire or test items by which *respondents* or testees may be classified. Because content facets and range facets are typically specified at the research-design stage, they may be referred to as definitional facets.

Facet Theory suggests that stable theories and meaningful measurements in domains of behavioral research can be advanced by discovering relationships between *definitional facets* and *empirical partitions* of suitable data-representation spaces. Thus: Given a definitional facet, a 1-1 correspondence may be hypothesized between its classes and the *regions* obtained by some partition of the space. Of the many kinds of spaces that have been proposed (Coombs, 1964; Lingoes, 1973), two stand out as especially useful for theory construction and measurement:

i. Spaces that depict a matrix of pairwise similarity measures, such as correlation or monotonicity coefficients, derived from the data (Smallest Space Analysis, SSA. See Guttman, 1968);
ii. Spaces that depict partially ordered sets (with or without coordinates), derived from the data (POSA or POSAC. See Shye, 1985).

Each of these two kinds of spaces may represent any one of two universes of analysis:

a. The investigated *content-universe*, represented by a sample of variables. (The variables are classifiable by any number of independent content-facets).
b. The investigated *population*, represented by a sample of respondents. (The respondents are classifiable by each of the range-facets; i.e., by their response to each variable).

Hence, a two-way classification of Facet Theoretical studies is obtained: the kind of space employed (similarity or partial order); and the universe being represented (content universe or population). The resulting four types of studies (Table 1) are illustrated and briefly described in the next section.

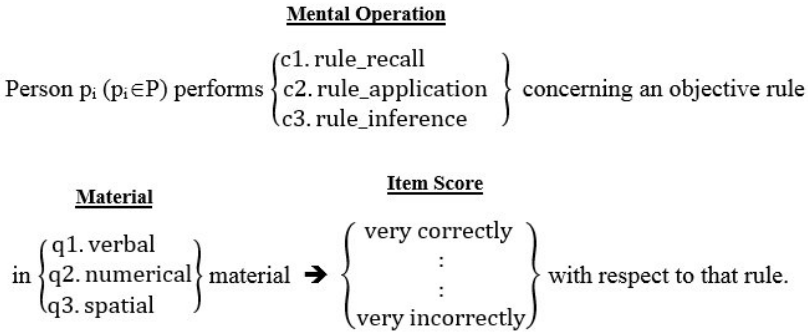
Table 1. A Two-Way Classification of Facet Theoretical Analyses: Kind of Space and Universe of Analysis (with illustrative studies described below)

	a. Content Universe	**b. Population**
i. Similarity space (SSA)	Example 1. Schlesinger & Guttman, 1969 Example 2. Shye, 1989	Example 3. Laumann & Pappi, 1973
ii. Partial Order space (POSA/C)	Example 4. Guttman, 1959	Example 5. Shye, 2020 Example 6. Kedar & Shye, 2015

THE FOUR TYPES OF FACET THEORETICAL STUDIES: EXAMPLES

I. Similarity Space Representing a Content Universe

Example 1: The Structure of Intelligence (Schlesinger & Guttman, 1969). The following (adapted) *mapping sentence* is a framework for intelligence test items:



A sample of intelligence items were processed by SSA (Guttman, 1968; Shye & Elizur, 1994; Shye, 2014a) confirming the two regional hypotheses:

1. The Material Content Facet corresponds to a partition of the Faceted SSA map of intelligence into sectors, each containing the items of a single material—verbal, numeric, and figural (spatial).

2. The Mental Operation Facet corresponds to a partition of the Faceted SSA map of intelligence into concentric rings, with the innermost ring containing inference items; the middle ring containing the rule-application items; and the outermost ring containing the rule-recall items.

The superposition of these two partition patterns results in a scheme known as the Radex Theory of Intelligence. See Figure 1. The Radex Theory of Intelligence has been replicated in several studies (e.g., Shye, 1988).

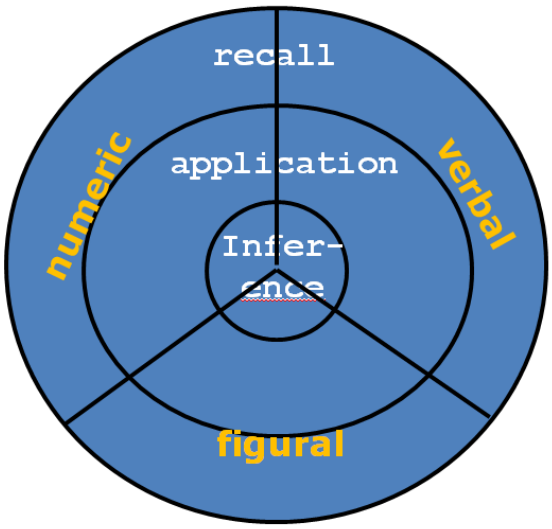


Figure 1. The Structure of Intelligence
An SSA Map of Intelligence Items Demonstrates a 1-1 Corresondence
(a) Between Classes of the Material Facet and Regions (Sectors) of an Angular Partition;
(b) Between Classes of the Mental Operation Facet and Regions of a Radial Partition
(Concentric Rings)

Example 2. The Structure of the Systemic Quality of Life (Shye, 1989; 2014b). The Structure of the Systemic Quality of Life (SQOL) was found to conform to a prediction based on the axiomatic theory of action systems (Shye, 2014c).

The Systemic Quality of Life (SQOL) has been defined as the effective functioning of human individuals in four functioning subsystems: the cultural, the social, the physical and the personality subsystems. The axiomatic foundations of SQOL suggest the hypothesis that the four subsystems should be empirically validated (i.e., item of each would occupy a distinct region) and that they be mutually oriented in space in a specific 2x2 pattern (i.e., personality opposite cultural, and physical opposite social), as shown in Figure 2. This hypothesis has been supported in many replications.

Personality Subsystem	**Physical Subsystem**
Social Subsystem	**Cultural Subsystem**

Figure 2. The Structure of Systemic Quality of Life

Types of partition patterns

Of the many possible partitions of a 2-dimentional SSA concept space, three stand out as especially useful for theory construction:

The Axial Partition Pattern: Partitioning of the space into stripes by parallel lines.
The Angular Partition Pattern: Partitioning of the space into sectors by radii emanating from a point in space.
The Radial Partition Pattern: Partitioning of the space into concentric rings by concentric circles.

The advantages of these partition patterns as likely models for behavioral data are that they are describable by a minimal number of parameters, hence avoid overfitting; and that they are generalizable to partition in spaces of higher dimensionalities.

In testing regional hypotheses, the fit of a content-facet to any one of these three models is assessed the Separation Index, a normalized measure of the deviation of variables from the region assigned to them by the model (See Borg & Shye, 1995).

II. Similarity Space Representing a Population

Example 3. The Structure of Community Elites (Laumann & Pappi, 1973). In this study, a reachability measure was defined between every pair of influential people, members of the elite in German town. The reachability matrix was processed by SSA yielding a map of the influentials of that town, in the form of a Radex that is high pertinent to sociological theories. From the Radex the authors infer two "principles" (in fact, two *facets*):

- "*The principle of integrative centrality* holds that persons playing key integrative or coordinating roles in a given structure will tend to be located in the central region of their space" compared with people at the periphery of that space.
- "*The principle of sector differentiation* divides the space into relatively homogeneous regions radiating from the center and including personnel who typically occupy key positions in the same institutional sector…"

Figure 3 is a schematic diagram of the SSA results obtained in this study.

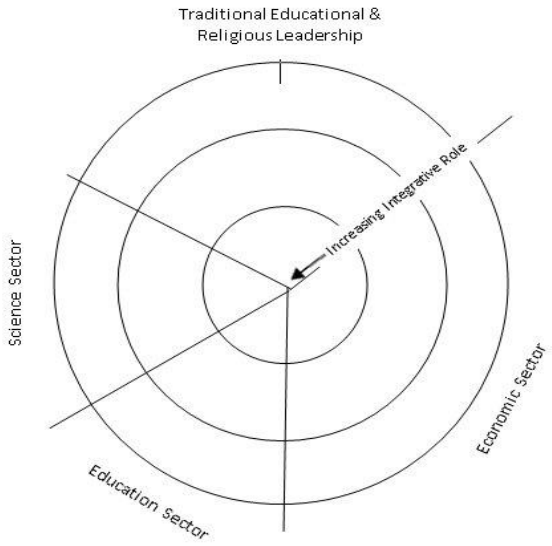


Figure 3. The Radex of Business-Professional Network: A Schematic Diagram

III. Partial Order Space Representing a Content Universe

Example 4. Attitudes towards Minorities (Guttman, 1959). Following Bastide and van den Berghe's (1957) study of interracial behavior in Brazil, Guttman (1959) content-analyzed the four types of interracial behavior described in the original Brazilian study: *Stereotype, Norm, Hypothetical Interaction, Personal Interaction,* by the following three facets:

Facet A: Subject's Behavior {a1=belief; a2=overt action}
Facet B: Referent {b1=subject's group; b2=subject himself}
Facet C: Referent's Intergroup Behavior {c1=comparative; c2=interactive}

The four behavior-types, their description and their *content-profiles* as determined by the three content-facets, are presented in Table 2. (Note that many specific behaviors may be classified under each behavior-type. Hence each behavior-type forms a sub-universe of behaviors).

Table 2. Bastide and van den Berghe's (1957) Four Types of Interracial Behaviors and their Content-Profiles by the Three Facets: Subject's Behavior, Referent, and Referent's Intergroup Behavior

Behavior Type Sub-universe	Description (re-phrased)	Content-Profile
Stereotype	*Belief* of (a white subject) that *his/her own group* (excels-does not excel) in *comparison* with black people on (desirable traits)	a1b1c1
Norm	*Belief* of (a white subject) that *his/her own group* (ought-ought not) *interact* with black people in (social ways)	a1b1c2
Hypothetical Interaction	*Belief* of (a white subject) that he *himself* (will-will not) *interact* with black people in (social ways)	a1b2c2
Personal Interaction	*Overt action* of (a white subject) *himself* (to-not to) *interact* with black people in (social ways)	a2b2c2

The content-facets can produce eight content profiles. Guttman (1959) performed a cartesian completion by specifying the four missing content-profiles and interpreting them as in Table 3.

Table 3. The Four Missing Content Profiles, Their Formal Contents and Their Interpretation

Content-Profile	Description	Interpretation: Proposed Behavior Type Sub-universe
a2b1c1	*Overt action* with reference to *subject's group* concerning *comparison* with black people	Teaching
a2b1c2	*Overt action* with reference to *subject's group* concerning *interaction* with black people	Preaching
a1b2c1	*Belief* that he *himself* (with respect to desirable traits) *compared* with black people	Feeling superior
a2b2c1	*Overt action* by *himself* with respect to *interaction* with black people	Acting superior

Now, in this particular case the three content Facets A, B, and C are all ordered by the same content criterion, namely, the *strength* of the behavior-type. Thus, in Facet A, *overt action* is stronger than *belief*; in Facet B, *himself* is stronger than *his own group*; and in Facet C, *interactive* is stronger than *comparative*. And in symbols: a1<a2; b1<b2; c1<c2. Hence, we find that *some* subsets of the eight behavior-types form *chains*; that is, in each such a subset, all content-profiles are *comparable* in the sense of *strength* as defined. For example, the following content-profiles form a chain:

$$a1b1c1 < a1b1c2 < a1b2c2 < a2b2c2$$

where, in general, two content-profiles, say, abc and a'b'c' are defined as *comparable*, with abc<a'b'c', if and only if $a \leq a'$ and $b \leq b'$ and $c \leq c'$. Since the set of eight profiles contains pairs of content-profiles that are *incomparable*, e.g., norm (a1b1c2) and teaching (a2b1c1), the entire set of eight behavior-type forms a partially ordered set that may be represented by a 3-dimensional cube. This cube, portrayed with its a1b1c1 vertex on top and with a3b3c3 at the bottom, constitutes a partial order graph, which may be simply partitioned by orthogonal three planes separating a1 from a2, b1 from b2, and c1 from c2, delineating regions that correspond to the definitional facets, A, B and C.

(The Partial Order relations may be represented by the 2-dimensional *Hasse Diagram*, as in Guttman (1959), see Figure 4. Here, however, *Hypothetical Interaction* appears twice to enable a 2-dimensional representation without crisscrossing).

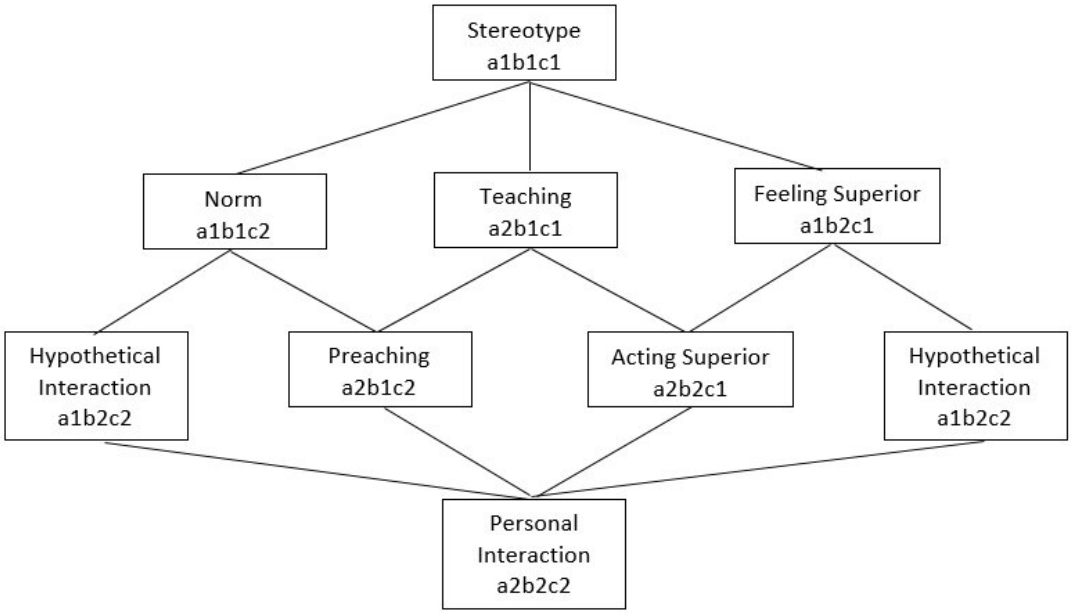


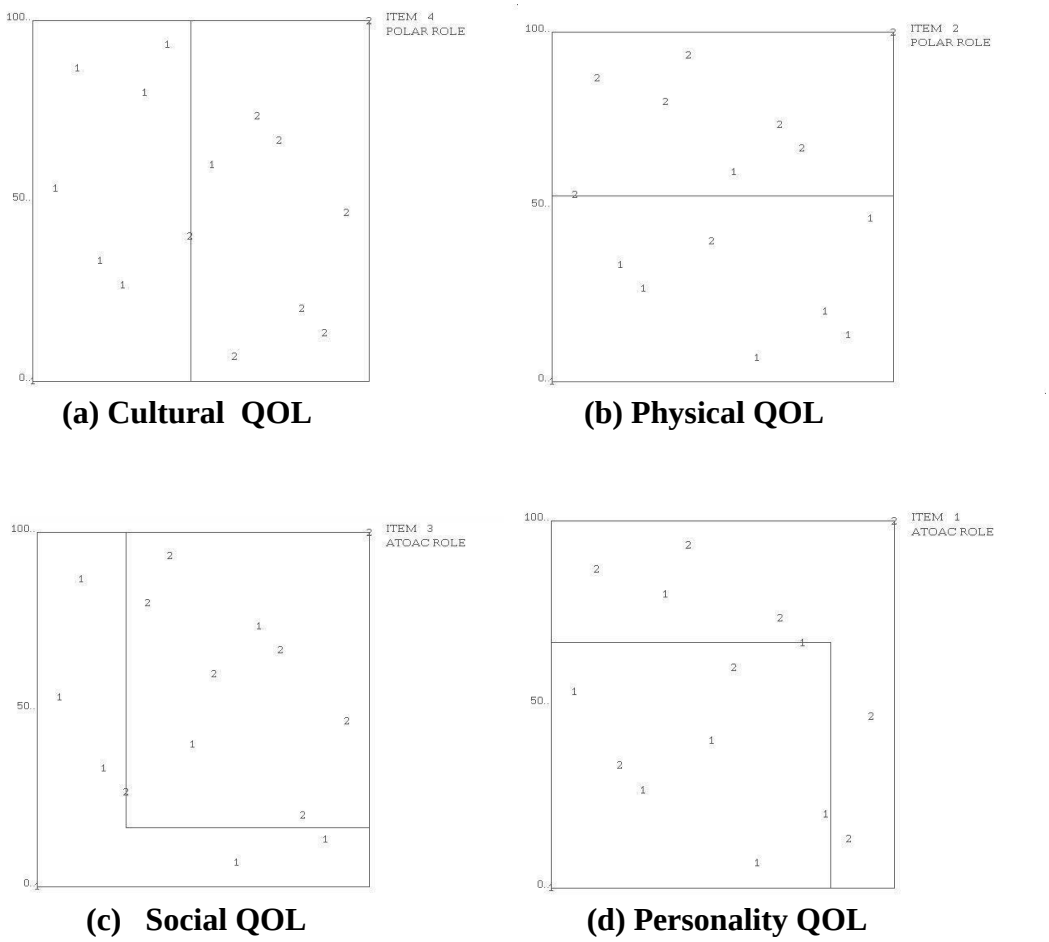
Figure 4. A Hasse Diagram Depicting the Partial Order Set of the Eight Behavior-Type Subuniverses, Containing Six Chains.

The empirical evidence for this partial order configuration is that each of its six chains would form a simplex (Guttman, 1954; 1959; Shye, 1999).

IV. Partial Order Space Representing a Population

The examples below illustrate Multiple Scaling by POSAC (Partial Order Scalogram Analysis by base Coordinates; Shye, 1985). This procedure is essentially an extension of the unidimensional Guttman Scale (Guttman, 1944; Coombs et al, 1978; Shye, 2008) to higher dimensionalities. Measurement by Multiple Scaling yields several coordinate-scales (*two* of them, with the present POSAC/LSA program) and supplies information for interpreting those scales. In accordance with Facet Theory's basic principle, the interpretation of the coordinate scales involves the establishment of 1-1 correspondence between certain combinations of scores of *some* of the variables (interpretable score sub-profiles) on the one hand, and intervals (1-d regions) on each coordinate, on the other hand.

Example 5. The Measurement of Quality of Life. A Theory-based measurement of the Systemic Quality of Life (SQOL) has been carried out as follows: For each of the four SQOL subsystems, validated by Faceted SSA as described above in Example 2, a composite variable was created and dichotomized. Every individual in the investigated sample obtained a profile of four dichotomized scores representing, respectively his or her quality of life in the Cultural Subsystem, Social Subsystem, Physical Subsystem and Personality Subsystem.
A four-item POSAC procedure yielded the 2-dimensional coordinate space of order-preserving mapping of the profiles, as well as *item diagrams*, one for each item, optimally partitioning the space into a region with low score and a region with high score, in that item. See Figure 5 (a)-(d).



(a) Cultural QOL **(b) Physical QOL**

(c) Social QOL **(d) Personality QOL**

Figure 5. Item Diagrams Depicting Optimal Partitions of the POSAC Space by Values of the Respective Items. Quality of Life in the cultural and the physical subsystems endow the X and Y coordinates, respectively, with their essential meanings. These meanings are enhanced by intervals induced by QOL in the social and pesonality systems

The range-facet elements (1, 2) of each item (variable) correspond to distinct regions in the POSAC space. In figure 6, the four item-diagrams are superposed to obtain a space-partitioning whose regions correspond to the profiles. The two coordinates are then interpreted as fundamental variables of Systemic Quality of Life, by deducing the meaning of intervals of each of coordinate from a Boolean-logical analysis of the binary-items partition lines. The two coordinates, once interpreted, constitute necessary and sufficient scales for a theory-based measurement of the Systemic Quality of Life.

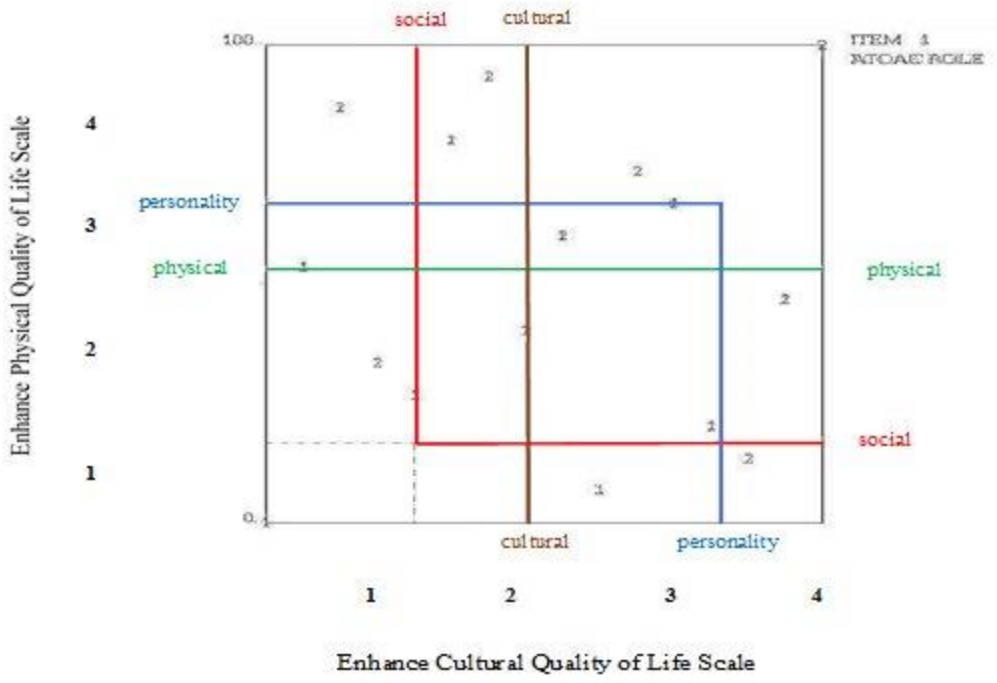


Figure 6. A Superposition of Figures 5 (a)-(d) Yields The POSAC Measurement Space Whose Coordinates are Interpreted as Fundamental SQOL Scales by Studying Intervals Induced by Regional Projection on Coordinate

The interpretation of the coordinate-scales is inferred from the shapes of the item partition lines. Item partition lines (each optimally separating high from low values in the respective item) induce the following intervals on the X coordinate-scale:

Interval 1. Low Cultural & Low Social QOL
Interval 2. Low Cultural & High Social QOL
Interval 3. High Cultural & Low Personality QOL
Interval 4. High Cultural & High Personality QOL

With these intervals, the X scale is conceived as a fundamental variable having a new meaning that refines and enhances that of the original Cultural QOL item.
Similarly, item partition lines induce the following intervals on the Y coordinate-scale:

Interval 1. Low Physical & Low Social QOL
Interval 2. Low Physical & High Social QOL
Interval 3. High Physical & Low Personality QOL
Interval 4. High Physical & High Personality QOL

With these intervals, the Y scale refines and enhances the meaning of the original Physical QOL item.

Example 6. Measuring Distributive Justice Attitudes (Kedar and Shye, 2015). Based on the systemic theory of distributive justice (DJ), alternative allocations of a supplementary educational

resource (say, 100 additional teaching hours) between gifted and disadvantaged pupils, may be classified by one of four types, the preference for each reflecting one's DJ attitude:

Equality, where the gifted and the disadvantaged pupils get the same amount of the supplementary resource.

Fairness, where the disadvantaged pupils get more of the resource than the gifted, in proportion to their assessed weakness relative to the gifted;

Utility, where the gifted get more of the resource than the disadvantaged pupils (so as to enhance future contribution to the general good);

Corrective Action, where the disadvantaged pupils get more of the resource than the gifted over and above the proportion of their assessed weakness relative to the gifted pupils (to compensate them for past accumulated disadvantage);

Following the Faceted SSA validation of the four DJ modes of Equality, Fairness, Utility, and Corrective Action, respondents' DJ attitudes were analyzed by POSAC to obtain the item diagrams and then their superposition -- the measurement space --shown in Figure 7.

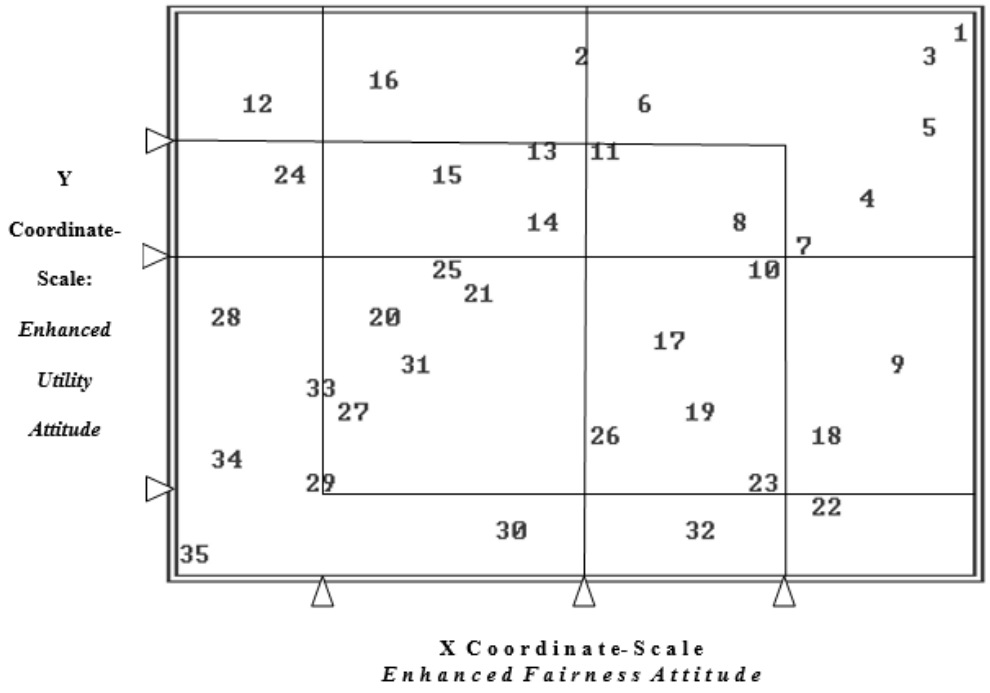


Figure 7. The Measurement of Distributive Justice Attitudes

In this case, again, four measurement intervals can be identified in each, the X and the Y coordinate scales, thereby defining their contents as new fundamental variables.

X-coordinate Scale, interpreted as Enhanced Fairness Attitude Scale

Interval 1. Low Fairness & Low Equality DJ Attitude
Interval 2. Low Fairness & High Equality DJ Attitude
Interval 3. High Fairness & Low Corrective Action DJ Attitude
Interval 4. High Fairness & High Corrective Action DJ Attitude

That is, Enhanced Fairness Attitude, even if low, (intervals 1 and 2) is somewhat present if Equality is favored (interval 2). And if Enhanced Fairness Attitude is high (intervals 3 and 4), it reaches the extreme level (interval 4) if Corrective Action is favored.

Y-coordinate Scale, interpreted as Enhanced Utility Attitude Scale

Interval 1. Low Utility & Low Equality DJ Attitude
Interval 2. Low Utility & High Equality DJ Attitude
Interval 3. High Utility s & Low Corrective Action DJ Attitude
Interval 4. High Utility & High Corrective Action DJ Attitude

That is, Enhanced Utility Attitude, even if low, (interval 1 and 2) is somewhat present if Equality is favored (interval 2). If Enhanced Utility Attitude is high (intervals 3 and 4), it reaches the extreme level (interval 4) if Corrective Action is favored. (This may well reflect the sentiment that, in the long run, the advancement of disadvantaged pupils serves the common good.)

THE BEAUTY OF FACET THEORY: A SUMMARY

Facet Theory hinges on the notion of *classification*: classifications of stimuli (variables) are called content-facets; and classifications of respondents (individuals) are called range-facets. But the notion of classification is not limited to the research design stage. It is carried over to the the data analytic stage of spatial representations; for the sought-after space-partitioning into regions is but a classifcation of all points in the representation space. The essence of Facet Theory is, simply, *the identification of 1-1 correspondences between two kinds of classifications:* definitional, *in the form of content or range facets; and* empirical, *in the form of space partitioning.*

Indeed, classification is a central notion in Science in general. But Facet Theory suggests that for the behavioral sciences, the notion of classification is a methodological cornerstone, a key to improving the validity and reproducibility in these sciences. The behavioral sciences are characterized by numerous, possibly infinitely many variables that must be considered simultaneously. Classification, a defining feature of Facet Theory, is the natural way to cope with infinitely many stimuli or responses.

It is commonly acknowledged that statistical propositions about a population may be reached by (i) sampling that population, and (ii) making inferences from the sample to the population. *Inferential statistics* is concerned with sampling procedures and inferential techniques, as applied to *populations* of interest.

Facet Theory acknowledges that in multivariate behavioral research, observed variables, too, form but a *sample* from a very large number of variables that make up the investigated *content universe*. Consequently, Facet Theory proposes a procedure (i.e., mapping sentence construction) for the stratified *sampling* of variables from the content universe; and a technique (i.e., Faceted SSA) for making *inferences* from the sample of variables to the entire content universe.

The representation-space of the content-universe (obtained as a map in SSA) provides an intuitively appealing scientific image: Every observed variable pertaining to the content universe is represented by a point marked in that space; and *conversely, every point in that space represents a possible variable of the content universe.* (Cf. the *Continuity Principle,* Shye, 1999; 2015). Observed variables marked on the SSA map serve as clues to reveal possible space-partitionings whose regions would correspond to content facets. In this process, a discovered suitable partition-pattern assigns and tests specific content-categories to points that represent unobserved variables. The (implied) inclusion of the entire content-universe in the analysis renders Facet Theory a powerful data analytic paradigm, with a high reproducibility of research findings. This is in contrast with other structural multivariate technique (cluster analysis, e.g.) that remain content with the analysis the (often-haphazard) sample of observed variables.

The above arguments concening the mapping of a content-universe *onto* a geomentic similarity space, hold in principle for spaces that depict partial order sets. While the data analysis itself is performed on observed respondents, the resulting spaces enable inferences concerning unobserved or hypothetical respondents as well.

Prominent theorists and practitionaires of scaling theory, in their attempts to explore and cover the widest range of representation spaces, have also referred to *joint spaces*, those that contain points corresponding to stimuli as well as points corresponding to individuals (see for example, Coombs, 1965; Lingoes, 1973). However, from the Continuity Principle it is clear that all the points of a representation space are reserved for the universe of entities of *one* kind, either variables *or* individuals but not both. Hence, as a methatheory – a theory that promotes theory- construction in behavioral research -- Facet Theory requires spaces of unifom texture; that is, spaces all of whose points are variables (observed or not), *or* all of whose points are respondents (observed or hypothetical). For only such a depiction can naturally sustain Facet Theory's unique sampling and inference procedures. Thus, Modern Facet Theory (Shye, 1998; 1999) avoids spaces of non-uniform entities.

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FACET THEORY AND MULTIDIMENSIONAL SCALING

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ASTRACT

This paper discusses the role of facets in partitioning MDS spaces. We begin by taking a closer look at MDS representations of proximity data. Then, hand methods to check if and how facets allow to partition an MDS space into regions are shown and illustrated. This is followed by a brief look at confirmatory MDS enforcing certain regional patterns. Finally, a new method is shown which uses support vector machines to identify facet-induced regions in MDS.

MDS, FACETS, AND REGIONS

MDS[1] (Kruskal, 1964; Borg & Groenen, 2005; Borg, Groenen & Mair, 2018) has long been a statistical technique found particularly useful in the context of empirical research based on facet theory. MDS represents proximity data (e.g., inter-correlations of test items) as distances among points in a low-dimensional space (typically with two or three dimensions). This allows researchers to understand, explore, or test the structure of the data.

Facets are classifiers based on attributes of the objects of interest or on conceptual notions that allow sorting these objects into classes. Facets are assigned by the researcher with the intent to *conceptually* structure the research domain. Intelligence tests, for example, often use tasks presented in numerical, geometric, or verbal language. They also require the test person to apply, find, or learn a rule that solves the task. The facets "language" and "rule" can guide the construction of test items or allow coding given items into different classes of test items (Guttman, 1965).

Given such a coding scheme, one can ask about its *empirical* usefulness: Do the facets allow to structure the data? One relevant correspondence hypothesis for an MDS representation of the items' inter-correlations is that items that belong to the same item class are all represented by points contained in the same region, and items of different classes fall into different regions. This general hypothesis can be strengthened by requiring that the regional boundaries satisfy certain additional criteria. For example, they could be predicted to be linear and parallel, and two facets can even form a checkerboard pattern in the plane. Such hypotheses are developed systematically in facet theory (Guttman, 1959; Borg & Shye, 1995).

Regions are parts of the MDS space. They result from partitioning the space into connected, non-overlapping, and exhaustive sub-spaces, just as dividing a map of the USA by inserting the boundaries of the U.S. states, or as cutting a pie into wedges. The overall pattern of the regions (e.g., a checkerboard-like pattern or a circumplex) may suggest a law of formation for the observed proximities.

In practice, the effects of facets are often difficult to identify in an MDS configuration, because the point classes representing different categories of a facet cannot be separated in space. Rather, they form fuzzy and overlapping clusters, or exhibit outliers leading to curvy regional boundaries. Such boundaries, in turn, prevent interpretations of the MDS space in the sense of a simple law of formation that is likely to hold across replications. Finding optimal compromise boundaries is rarely easy in practice, in particular if there are many points and if there is little previous experience with the particular content domain. In the facet theory literature, the partitioning and visualization nowadays is most often done "by hand", using pencil and eraser in a trial-and-error fashion, guided by experience, and limited to 2D or 3D solutions.

THE MDS SOLUTION

An MDS "solution" for a given set of data is always an *approximate* representation of the proximities by distances among points in space. It is computed by an algorithm that minimizes a certain "loss function" called *Stress*, a function that adds (over all pairs *i* and *j*) the differences of the distance between points *i* and *j*, $d(i,j)$, and the corresponding observation, i.e. the proximity of objects *i* and *j* (pre-processed to a measure of dissimilarity, $\delta(i,j)$). If the distances correspond to the dissimilarities, the Stress is zero and the solution is perfect.

A basic decision when running MDS is what properties of the dissimilarities should be preserved (as much as possible) in the MDS distances. One would never really require that $d(i,j)=\delta(i,j)$. The most one would request is that the ratios of the distances correspond to the ratios of the dissimilarities. That is, the overall size of the MDS configuration could be shrunk or enlarged, or, expressed conversely, the dissimilarities could be re-scaled to $a*d(i,j)$, with $a>0$. This means that the data are interpreted on a *ratio scale*, and *ratio MDS* is the MDS model that tries to preserve the ratios of the data in the distances. If only the *order* of the data is considered interpretable, one should choose a "weaker" (i.e., less demanding) MDS model, one that maximizes the correspondence of the order of the distances and the order of the data. This is accomplished by *ordinal MDS*. Another choice is *interval MDS* which (optimally) preserves the differences ("intervals") among pairs of data values, attempting to map the dissimilarities *linearly* into MDS distances.

Consider a case from research on personal values. It uses data collected with the PVQ40 (Portrait Value Questionnaire) which presents items describing a person and asking the respondents how similar they feel to this person. Its 40 items are classified by a content facet (Schwartz, 1992) into ten "basic values": Power (PO), achievement (AC), hedonism (HE), stimulation (ST), self-direction (SD), universalism (UN), benevolence (BE), tradition (TR), conformity (CO), and security (SE). The basic values are expected to lead to a circumplex in MDS space, i.e. to a configuration of regions organized like ten wedges of a pie, with each basic value corresponding to one wedge. Moreover, the wedges are predicted to be ordered as PO-AC-HE-...-SE-PO, with the sub-groups of "higher-order values" CO/TR opposite to HE/ST/SD, and PO/AC opposite to BE/UN.

We use R to compute the correlation matrix of a PVQ40 sample (described in Borg, Bardi, & Schwartz, 2017), then convert the corresponding correlations (=similarities) into dissimilarities,

and then use the R-package SMACOF (De Leeuw et al., 2009; Mair et al., in press) for MDS, show

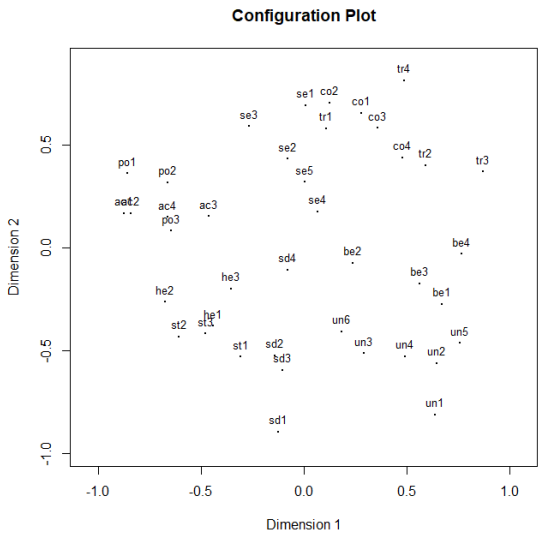

Figure 1. MDS solution for PVQ40 inter-correlations (Stress=.168)

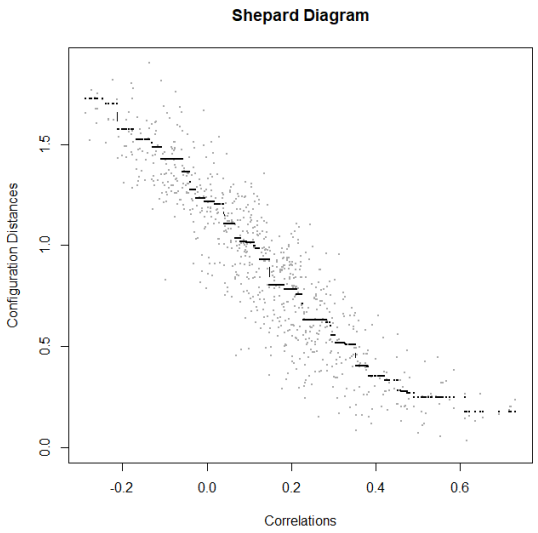

Figure 2: Shepard diagram for MDS solution of Figure 1; data (X-axis) vs. distances (Y-axis)

the Stress, and plot the solution. In R, this is accomplished by the commands:

```
# The PVQ40 data come with SMACOF
R <- cor(PVQ40) # compute correlations
diss <- sim2diss(R) # transform correlations into dissimilarities
solution <- mds(diss, type="ordinal") # run ordinal MDS
solution # reports the Stress of the solution
plot(solution) # generates the plot in Figure 1
```

SMACOF responds by reporting the Stress of the solution as .168. It then plots the solution (Figure 1), where the points are labeled showing their facet coding in the first two characters (e.g., se1, for item #1 of the SE items). These labels were written into the data file as the names of the PVQ40 items.

Before attempting an interpretation, we must ask a few technical questions. First of all, how good is the fit? Is a Stress of .168 acceptable? To answer this question, we can compare this Stress value to the Stress one can expect for *random* data. This value can be computed in SMACOF by scaling 40 points in 2 dimensions for 100 replications of random dissimilarities:

```
ex <- randomstress(n=40, ndim=2, nrep=100, type="ordinal")
mean(ex); min(ex)
```

We get an expected Stress of .358 and a minimum of .349. Thus, we conclude that the fit is "highly significant", i.e. much smaller than can be expected for random data. A sharper test is also possible, based on random permutations of the *given* (not random) data (Mair et al., 2016):

permtest(solution). Based on 100 replications, this yields $p<0.001$. Thus, we arrive at the same conclusion that the fit is "significant".

But is this Stress value also "good"? One answer is given by the *Shepard diagram* in Figure 2. It plots the data (here: the correlations) against the MDS distances. One notes that the scatter about a *monotonic* regression curve (black points in plot) – monotonic because we used *ordinal* MDS – is relatively small and in a range that could be interpreted as due to error in the data:

```
plot(solution, plot.type="Shepard", shepard.x=R)
```

We also see that the regression trend is *almost linear*. Hence, we could also consider using *interval* MDS rather than ordinal MDS. After all, the Pearson inter-correlations assume an interval scale level of the rating data collected by the PVQ, and using interval MDS would therefore only be consistent. Moreover, interval MDS solutions are often also *more robust*, avoiding to *overfit* the data. To run interval MDS requires almost no extra work. Just change the type argument in the mds() function:

```
solution.i <- mds(diss, type="interval") #run interval MDS
```

The Stress of this solution goes up to .191 due to the *stronger constraints* of an interval solution. The resulting configuration (not shown here) is nevertheless quite similar and so we might even consider using this configuration as our final solution. However, that depends also on further considerations, such as, in particular, the configuration's replicability with new data, and its interpretability. (In research on personal values, ordinal MDS is usually the preferred MDS model.)

As a final technical issue, one should also take a look at the contributions of each *single* point to the *global* Stress. An acceptable global Stress does *not* guarantee that all data are well represented in the configuration. There may be "outliers" and poor items, for example. To check this, we simply call the Stress-per-Point or SPP coefficients which are automatically computed by SMACOF MDS runs. The SPP values can be printed and plotted as follows:

```
round(solution$spp, 2) # rounded here to 2 decimals
plot(solution, plot.type="stressplot")
```

The SPP plot is shown in Figure 3. We notice that some items contribute substantially more than others to the overall Stress (sd4, in particular, with 5.57%). With 40 points, the expected contribution of each point is 1/40 *100 = 2.5%, and so we might at least take a closer look at the sd4 item and check how it is formulated (Could it be improved? Can it be misunderstood?). On the other hand, even sd4 does not seem to be a true outlier, and so we would probably not dump it.

Related to SPP values is computing confidence regions surrounding the points of the MDS solution (see Figure 7 for an example). SPPs and confidence ellipses show to what extent one can rely on the points' positions and to what extent there is some freedom when drawing regional boundaries in MDS space.

INTERPRETING THE MDS SOLUTION USING FACETS

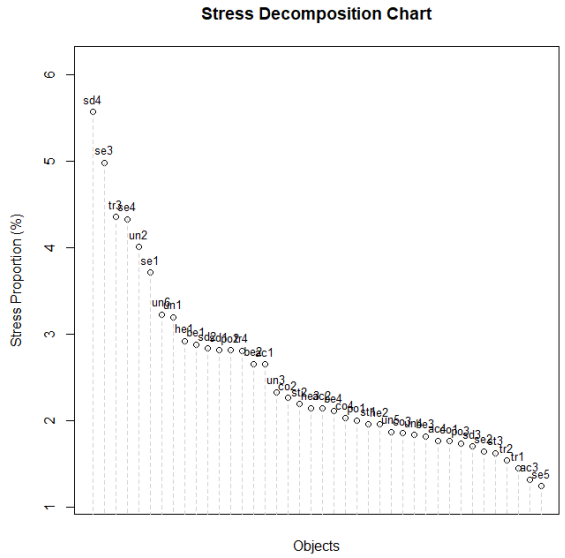

Figure 3. Stress-per-Point plot for the ordinal MDS solution in Figure 1

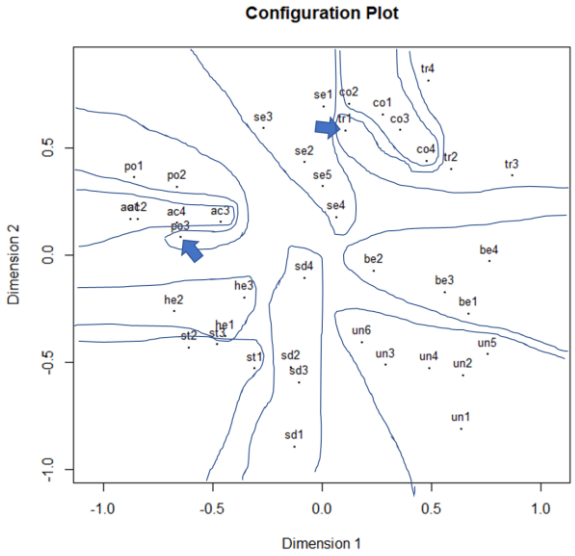

Figure 4. Partitioning the MDS configuration by hand; points marked by arrows lead to curvy boundaries

The considerations above could lead us to consider the ordinal MDS solution of all 40 points as our preferred candidate for interpretation. What we now want is to check if and how the basic-value facet allows us to partition the MDS space into regions. Since the points are already associated with labels showing how the items are classified by the basic-value facet, partitioning would begin by printing the solution and trying to divide it up using pencil and eraser, or importing the plot in a graphics program and then proceeding on the computer screen.

Drawing boundary lines into the MDS configuration in PowerPoint leads to Figure 4. This already looks like a fairly simple pattern, although there are two points (marked by arrows) that either lead to "curvy" boundary lines or to overlapping regions.[2] (sd5, our worst-fitting point, is not one of them. Hence, dumping this point would not simplify the regionality of the plot.) With many points, such an initial partitioning may require some work that can be reduced by first producing a plot where the various point classes are enveloped by convex hulls (Figure 5). To produce such a plot, we first set up a vector that contains the facet codes of the items, and then generate the plot:

```
codes <- substring(colnames(PVQ40), 1, 2)
plot(solution,hull.conf=list(hull=T, ind=codes, col="red", lwd=2))
```

The resulting plot is easier to partition than the plot in Figure 1. It also quite clearly shows the two problematic items that lead to overlapping regions if one insists that the regional boundaries remain "simple".

Why should boundaries be simple? The first reason is replicability: Wildly curving boundaries are most likely not replicable. The second reason is that bizarre boundaries make it hard to formulate

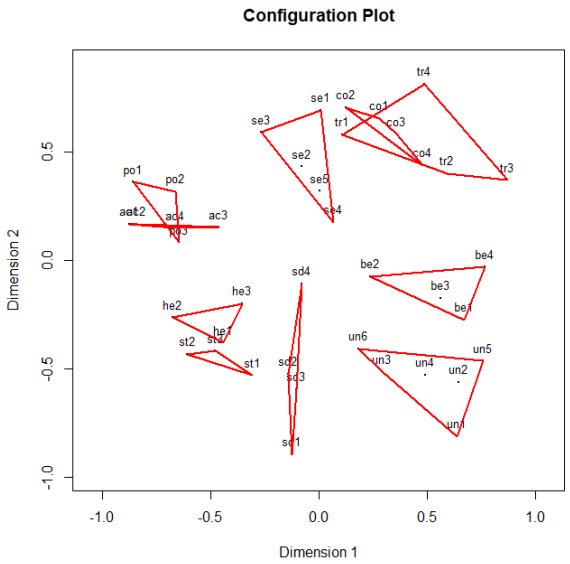

Figure 5. MDS configuration of PVQ items with hulls for point classes defined by basic-value facet

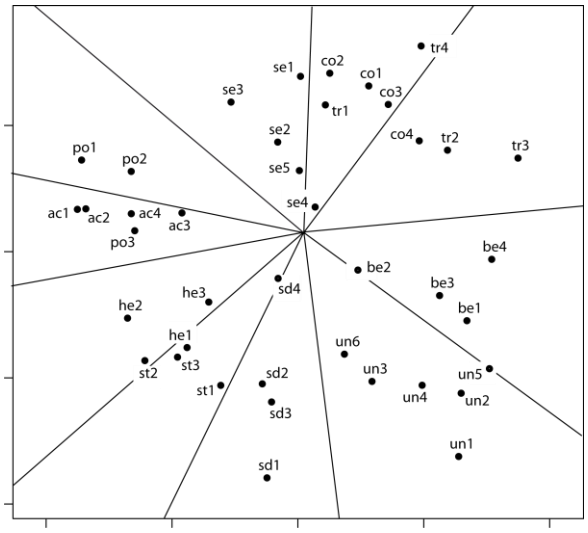

Figure 6. MDS configuration of PVQ items with simple partitioning boundaries showing a circumplex

a reasonable "law" that partitions the space such as, for example, "the space is partitioned like a cake cut into wedges, i.e. by straight rays emanating from a common origin." Often, it is therefore better to admit some errors at the expense of a simple partitioning pattern. Such a simple regionality in the sense of a *circumplex* (i.e., a circle of regions) is shown in Figure 6.

It is often argued that admitting some errors is not that serious because shifting a few points a little would eliminate these errors and not drive the Stress up very much. But just how much is "not very much"? This is almost always left open. In SMACOF, we can easily check the effect of such movements on the Stress by taking the co-ordinates of the solution (X=solution$conf) and change the co-ordinates of points that do not fit so that they would fit. Let the modified X be Y, then its Stress can be computed by invoking stress0(diss, init=Y, type="ordinal"). Note that a minor increment in global Stress can be misleading: If there are many points, shifting just one or two points will almost always not have much impact on the global Stress, but it can wipe interesting information under the carpet (see below: Morse code example).

If the PVQ data had a second facet, it could possibly further structure the MDS configuration in a concentric way, from the inside to the outside. Such a facet would "explain" why some points are in the center of the circumplex, and others on the outside. This pattern where two facets[3] organize the space in a radial and in a concentric way is called a *radex*. It is observed in many fields (color vision, intelligence testing, etc.), where items closer to the center are more similar to each other (Shye et al., 1994). Hence, the MDS plot can also motivate the researcher to look for further facets.

Finding facets that work robustly in partitioning an MDS space can also suggest refinements of the facets and their roles in structuring the data. The above value circumplex led to stronger MDS hypotheses, pushing the *circumplex* of values to a *circle* of values. One notices in Figure 5 that the point classes form clusters so that when computing indexes summarizing the value classes, the

indexes would fall on a circle in MDS space. To test this, we compute an MDS solution for these indexes with the commands shown below. They generate the MDS solution in Figure 7.

```
delta <- sim2diss(cor(PVQ40agg, use="pairwise.complete.obs"))
sol <- mds(delta, type="ordinal")
resboot <- bootmds(sol, data=PVQ40agg, method.dat="pearson")
plot(resboot, xlab="", ylab="", main="", xaxt="n", yaxt="n")
c <- fitCircle(sol$conf[,1], sol$conf[,2])
draw.circle(c$cx, c$cy, radius=c$radius, border="blue", lty=2)
```

The above commands also fit a perfect circle to the 10-point solution. Moreover, confidence ellipses are computed by a *bootstrapping* method (Mair et al., 2017). It all shows that the value indexes form an almost perfect circle and the positions of the points are fairly reliable.
One could also use *spherical* MDS (Borg et al., 2018) to *enforce* a perfect circle in two dimensions, but *exploratory* MDS usually suffices to generate almost perfectly circular configurations of basic values (with a predicted order of points, and with predicted oppositions of points classes). This is a good example how a facet-based research approach can eventually lead to a parametric model.

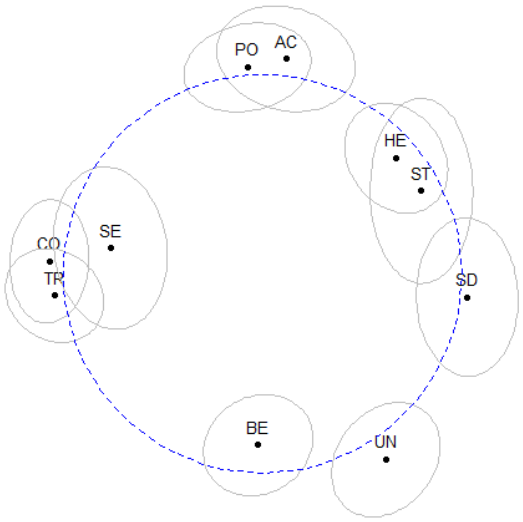

Figure 7. Value indexes, with confidence ellipses and fitted circle

USING CONFIRMATORY MDS IMPOSING CERTAIN REGIONALITIES

Regional patterns can also be *enforced* onto an MDS solution. Using confirmatory MDS techniques, the MDS solution then *guarantees* to satisfy a certain regionality, usually at the expense of higher Stress. Borg & Lingoes (1980) developed a method and algorithm that allows to impose restrictions onto the distances in MDS space such as, for example, forcing all points on a circle or separating point classes from each other. Formulating such restrictions is, however, often not as easy as setting up linear constraints on *dimensions* in MDS space (Borg et al., 2018).

Consider a classic case. Rothkopf (1957) studied to what extent test persons confused different acoustic Morse signals. He used 36 different signals, the 26 letters of the alphabet, and the natural numbers from 0 to 9. The signal for A, for example, is “di” (a beep with a duration of 0.05 seconds), followed by a pause (0.05 sec) and then by “da” (0.15 sec). We code this as 1-2 or 12 for di-da. The symmetrized confusion probabilities collected for these signals from hundreds of test persons are represented in Figure 8. The partitioning lines were inserted by hand. They cut the plane in two ways, related to two facets: The nine solid lines discriminate the signals into classes of signals with the same total duration (from 0.05 sec to 0.95 sec); the five dashed lines separate the signals on the basis of their composition (e.g., signals containing only long beeps are all on the right-hand side). The pattern of these partitioning lines is partially rather curvy. Particularly the dashed lines are so twisted that the pattern of the emerging regions does not exhibit a simple law of formation. Rather, the partitioning

seems over-fitted. The substantive researcher, therefore, would probably not bet that it can be replicated with new data.

We now straighten the two sets of partitioning lines. To generate such lines, we use the facets shown in Figure 8 by the vertical black boxes ("duration") and the boxes on top labeled as "1'", "1>2", "1=2", "2<1", and "2'" ("type"). Each Morse signal is coded in terms of its duration into one of ten categories, and in terms of its type into one of five categories. This defines the external constraint variables in the 36-by-2 matrix morsescales. We then run a confirmatory MDS with the solution of the exploratory MDS as the initial configuration:

```
res.exp <- mds(morse, type="ordinal")
res.con <- smacofConstraint(morse, type="ordinal", eps=1e-8,
           constraint="linear", external=morsescales,
     init=res.exp$conf, constraint.type="ordinal")
```

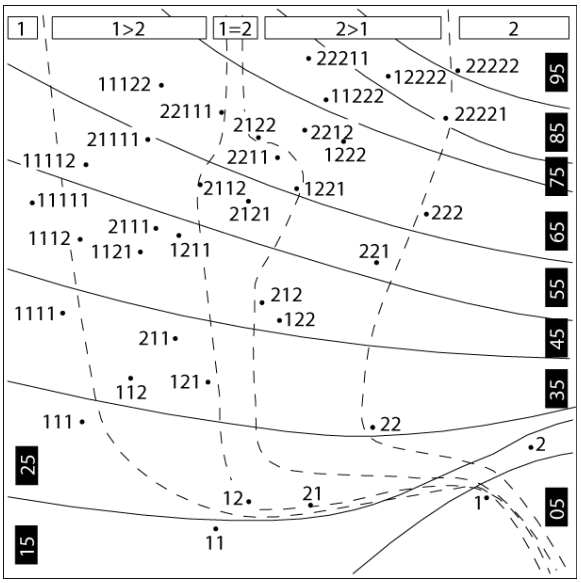

Figure 8. MDS solution for Morse codes

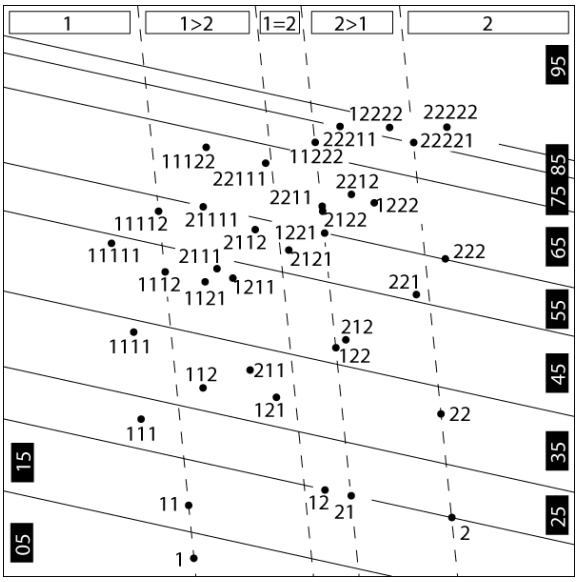

Figure 9: MDS solution with axial regions enforced onto the configuration

The confirmatory MDS solution (Figure 9) has almost the same global Stress as the exploratory MDS solution in Figure 8 (0.21 vs. 0.18). Upon closer investigation one notes, however, that the confirmatory solution moved only very few points by more than a small amount. Particularly, point 1 (at the bottom, to the right) was moved a lot so that the substantive researcher may want to study this signal (and its relationship to other stimuli such as signal 2) more closely. What this shows is that a small increment in global Stress can be misleading in the sense that one *misses interesting information*. Thus, we recommend to never use confirmatory MDS without comparing it to exploratory MDS (which *lets the data speak for themselves*).

Confirmatory MDS can also be used to test how strong the facets are. It seems that some facets are "trivial" in the sense that they allow to perfectly partition almost any MDS configuration, given

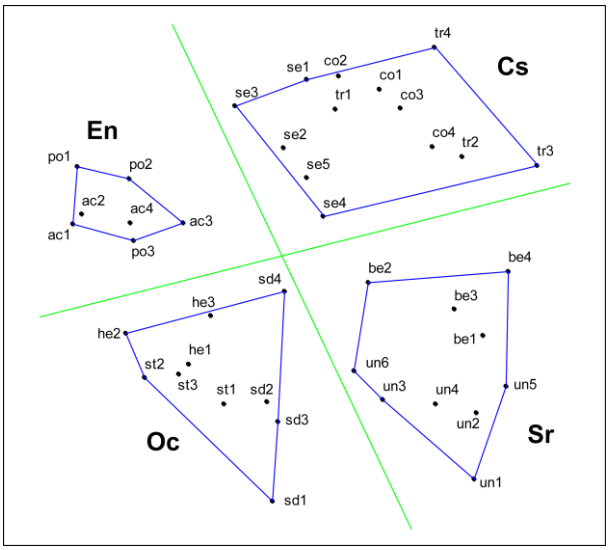

Figure 10. MDS solution as in Figure 1, with points grouped into higher-order values, and with two partitioning lines.

that the number of points is small enough. Consider a case. For the basic values measured by the PVQ, Schwartz (1992) suggested grouping them into four "higher-order" values: Cs=conservation, Oc=openness to change, En=self-enhancement, and Sr=Self-transcendence. The h.o. values are predicted to be psychologically opposite to each other: Co vs. Oc, and En vs. Sr. Figure 10 shows that when coding the various items by the h.o. facet, one notes indeed that the items can be cleanly separated into clusters corresponding to the four h.o. values. The clusters exhibit the predicted oppositions. One may wonder, though, whether such a relatively simple 2x2 partitioning ("*duplex*") in MDS space is not trivial. We can test this by randomly permuting the facet coding of the items and then run confirmatory MDS enforcing the duplex. In 100 replications, we obtained an average (minimal) Stress of .43 (.35) – much higher than the Stress of .17 obtained for the solution in Figure 10. Hence, enforcing duplexes with permutations of the h.o. facet does not allow acceptable MDS representations of the observed inter-correlations, at least not with as many as 40 points! With fewer points, one should run similar simulations to test the facet's strength.

USING SUPPORT VECTOR MACHINES TO IDENTIFY REGIONS

The above examples are all using 2-dimensional MDS with a relatively small number of points. Yet, even in case of the 2-dimensional Morse code data example shown above, identifying a regional pattern that corresponds to a particular facet can be quite hard. A new approach that leaves much of this work to the computer is utilizing support vector machines (SVMs). SVM is a supervised learning method within the discipline of statistical/machine learning (James et al., 2015).

An SVM searches for ways to separate point classes[4] using maximal margin classifiers, i.e. hyperplanes that are farthest from the point classes in MDS space. SVMs can handle any number of classes, as well as any dimensionality. The boundaries can take almost any shape, including linear, radial, and polynomial, among others. SVMs use rather sophisticated mathematics that are beyond the scope this paper. SVMs are tuned through cross-validation which gives an optimal parameter setup for the data at hand ("training data").

We can run an SVM analysis on the PVQ40 items by first finding an MDS solution, and then partitioning it using SVM (with some user-specified arguments: kernel type and a range of "costs" which quantify the penalty for misclassifying points) as follows:

```
facet.coding <- as.factor(substring(colnames(PVQ40), 1, 2))
delta <- sim2diss(cor(PVQ40, use="pairwise.complete.obs"))
res.mds <- mds(delta, type="ordinal")
X <- res.mds$conf # X=matrix of coordinates of MDS solution
df <- data.frame(class=facet.coding, X)
costvec <- seq(1, 20) # some costs of misclassification: 1, 2, 3, …
res.svm <- tune.svm(class~D1+D2, data=df, kernel="linear", cross=10,
                    cost=costvec)$best.model # find best model
svm_mdsplot(res.mds, res.svm, facet.coding) # plot MDS with SVM regions
```

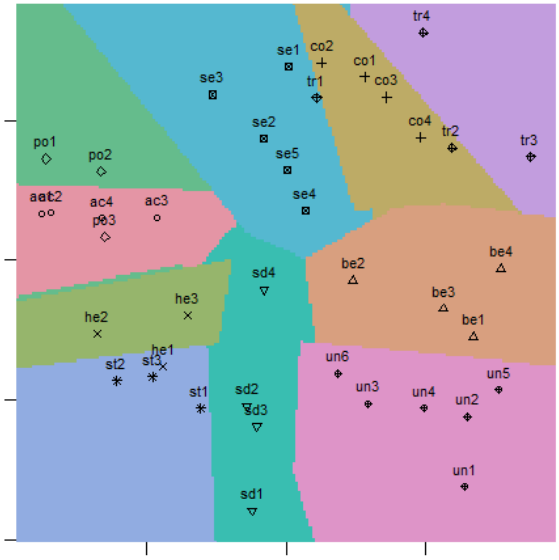

Figure 11. PVQ40 MDS plot with SVM generated regions based on basic-values facet

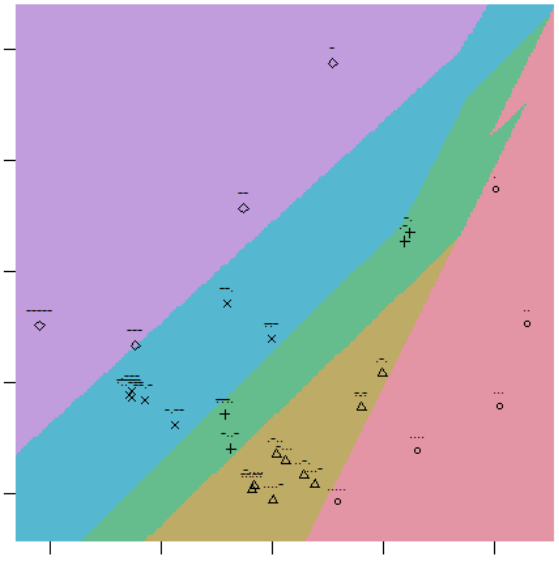

Figure 12. Morse codes MDS plot with SVM generated regions based on facet "type"

This leads to the "best model" shown in Figure 11. It obviously comes close to the partitioning shown in Figure 6 which required quite some time and craftsmanship. Another example using SVM is shown in Figure 12. This plot exhibits the solution for the Morse code data, partitioning the space based on the facet "type". If rotated by about 180 degrees, the plot corresponds closely to Figure 9 with its dashed vertical boundary lines.

It should be noted that the SVM method is always based on the given configuration of points in MDS space. Researchers employing facets in MDS sometimes pick or prefer regionalities with regions that are not supported everywhere by points, exhibiting large parts that are empty. For example, concentric circles are used to partition points that sit essentially in a few clusters only. The choice of such a regionality is based on the argument that the empty parts of the regions would be filled if more data were collected by items from the same "universe of items". These are considerations that go beyond the given data and that are not taken into account by the SVM method. An SVM result may, however, serve as a basis for speculating beyond the given data.

DISCUSSION

More SVM examples are shown in the presentation at the conference in Prague. There is also room for discussion and for outlining the various possibilities of using SVM in MDS and FT. And there is also more to come in future publications (Mair, Cetron, & Borg, in preparation).

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Notes

[1] Note that SSA (abbreviated from "smallest space analysis", Guttman, 1968; also known as "similarity structure analysis", Borg & Lingoes, 1987) is another but nowadays rarely used name for MDS. Computer programs called SSA *always use ordinal MDS*. SSA programs use algorithms that do not necessarily converge to Stress minima.

[2] In MDS, often several configurations exist that have *almost* the same Stress. These solutions can be similar but also radically different. One should pick the one (see Borg & Mair, 2017) that is best interpretable rather than one that is technically the best (i.e., has the smallest Stress). Interpretable configurations make substantive and theoretical sense, which is the researcher's basis for expecting that are also robust and replicable.

[3] Another pattern with two facets is the classic "dimension system", where two facets lead to a checkerboard-like regionality (in the plane).

[4] An early computational approach is due to Shye and colleagues. They seek to partition the (2-dimensional) MDS space either by parallel straight boundaries, or by straight lines emanating radially from a fixed origin in space, or by concentric circles such that certain separation indexes are maximized (see Borg & Shye, 1995).

THE RELATIONSHIP BETWEEN SYSTEMIC QOL STRUCTURES AND LEVELS: DO WELL STRUCTURED MAPS INDICATE HIGHER QUALITY OF LIFE?

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ABSTRACT

The systemic quality of life model developed by Shye (1985; 1989) is one of the better-founded models for understanding and investigating human well-being (Taillefer et al. 2003). The model defines quality of life as the effective functioning in four functioning modes (Expression, Adaptation, Integration and Conservation) in four functioning sub-systems (Personality, Physical, Social and Cultural). The model not only defines the concept of quality of life but also formulates a theory about "classical", well-structured QOL.

This study takes a second look at four studies (*comparing Jewish and Arab students QOL; comparing people that live in deep poverty to Low Middle Class people- that live in the same neighborhood; comparing QOL of reserve duty soldiers with high vs low confidence in their superiors; comparing QOL of successful vs unsuccessful immigrants*). In each study we find two subgroups with different QOL Structures, the findings of the current study verify the hypothesis that classical structures yield higher quality of life.

A closer inspection of the different structures raises interesting theoretical insights regarding the possible role of Social exclusion dynamics on changes in QOL structures, as well as declining levels of Quality of life.

INTRODUCTION

The Systemic Quality of Life Model was developed by Shye (1979; 1985; 1989) and strives to provide a comprehensive and exhaustive description and analysis of action systems. The Systemic Quality of Life Model defines the quality of life of any **action system** according to two **facets**: modes of functioning and Subsystems. Each of these facets comprises four elements: expression, adaptation, integration and conservation in modes of functioning, and personal, physical, social and cultural in the Subsystems. The matrix obtained by cross-referencing the four Subsystems with the four modes yields the sixteen content areas that comprise the **quality of life matrix**. An action system's high quality of life refers to a situation whereby the system has a high level of effective functioning in each of the sixteen content areas. In the last Three decades the model was used in more than 70 scholarly works (Shye, 2015)- establishing the model Validity, Reliability as well as suitability for a variety of research populations, Contexts and fields of knowledge.

One of the unique features of the SQOL model is the ability to inspect and to theorize not only the Levels of QOL but also its Structure. With the most basic and important concept being the "General Human System" Model developed by Shye (1985), the model predicts that the Ideal Human QOL Structure to be an Angular structure with the Personal Subsystem being polar with the Cultural Subsystem and the Physical Subsystem Being polar to the Social Subsystem (see figure 1).

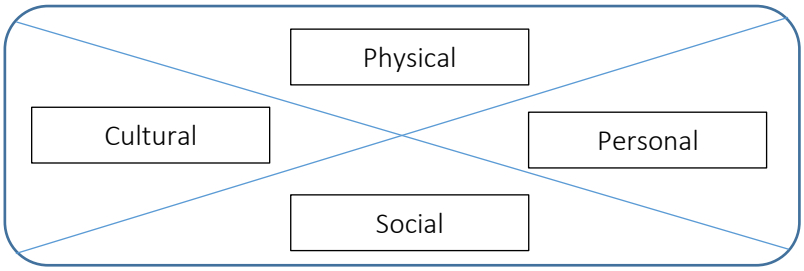


Figure 1. The General Human System (GHS)

SQOL Structures that deviate from the GHS were considered to be interpreted by researchers as indicating a problem in the systems functioning (See Davidson-Arad & Wozner, 2001) relying more on the theoretical power of the model than on empirical investigations that links SQOL structures to SQOL levels. The current study addresses this task by examining the link between SQOL Structures and SQOL levels in four previous research: the research will examine the Hypotheses that the SQOL of people with Theory induces Structures will be higher than the SQOL of people with Unorthodox Structures.

METHOD

The current research is based on four previous investigations:

1. Beinish- Weisman & Shye (2011) research which investigated the SQOL of Successful Vs Unsuccessful Immigrants.
2. Barnetz (2015) research which investigated SQOL of People living in deep poverty to Median- Low Income Families living in the same Peripheral neighborhood.
3. Barnetz (2013) research which investigated Reserve combat troops with High Vs Low levels of trust in their high command
4. In the same research, Barnetz (2013) Comparison of the SQOL of Jewish and Arab Students in an Israeli College.

At each of the four groups we have one group with A classical, theory induces structure (Namely, a clear division between the Subsystems) and an unorthodox structure.

We have been Able to reach the original databases and performed all analysis presented in the current paper.

For each of the four investigations we performed two analyses:

-SQOL Structures: Based on Multi-Dimensional Scaling (MDS) analysis.

-Independent T-Test Analysis as a way to investigate the Group difference.

For further information on sample size, Reliability ext. please look at the original research.

RESULTS

Study 1: Successful Vs Unsuccessful Immigration from USSR to Israel:

Figures 2-3presents the MDS maps of the two groups:

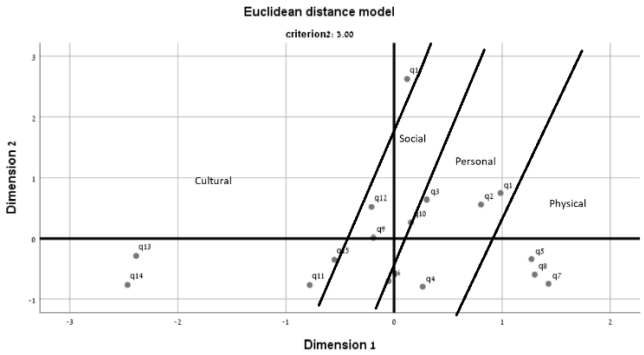


Figure 2. SQOL Map of Successful Immigrants

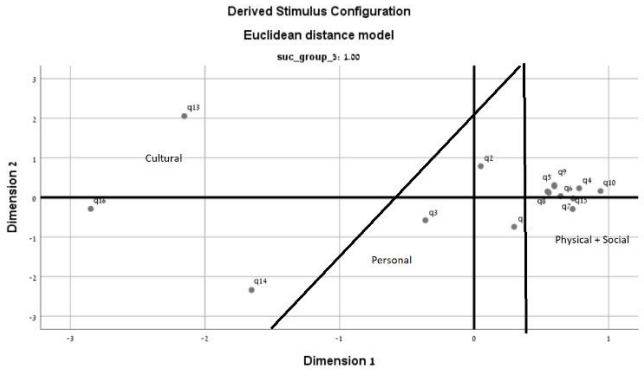


Figure 3. SQOL Map of Unsuccessful Immigrants

As can be seen in the MDS figures, the Successful Immigration group exhibits a clear partition between the subsystems, with the Physical and Personal Subsystems on the right and the Social and Cultural Subsystems on the left, a structure found in previous research (Barnetz and livne, 2009). The Personal and the Physical subsystems are known in the literature as the Individual Subsystem and the Social and Cultural Subsystems represent the Collective Subsystems, therefore the successful group shows an Individual- Collective Partition.

The Unsuccessful group, we can see that the Physical and Social Subsystems Merged into one un-partitioned region on the right side of the map, with the Personal and Cultural Subsystems on the left, such structure Breaks the Individual- collective Partition.

In order to examine the Hypothesis that the Quality of life of the "Successful immigration" group is higher than the "Unsuccessful immigration" group we conducted a series of T Tests, both for the 16 cells of the QOL map, the four Subsystems, the four Functioning modes and the overall levels of QOL.

Due to space limitations we only present the T scores and significant levels for the tests, as including all the Means and standard deviation will be to lengthy.

Table 1. T Scores and Significance Levels of Successful vs. Unsuccessful Immigrants

	Personal	Physical	Social	Cultural	Total
Expression	T=2.18 Sig<0.01		T=2.68 Sig<0.01		T=3.7 Sig,0.001
Adaptation				T=2.48 Sig<0.001	T=2.15 Sig,0.05
Integration			T=2.1 Sig<0.05		T=30 Sig,0.01
Conservation			T=2.63 Sig<0.01		T=2.7 Sig,0.01
Total	T=3.45 Sig<0.001	T=2.24 Sig+0.05	T=2.8 Sig,0.01	T=2.4 Sig,0.05	T=3.43 Sig,0.001

As can be seen in Table 1, we found significant differences between the group in five of the 16 QOL cells three of which are in the Social subsystem, as unsuccessful immigrants reported lower levels of QOL in Social Expression , Social Integration and social Conservation, significant differences were found for Personal Expression And Cultural Adaptation.

The Analysis for the Four Subsystems, the four functioning modes and overall QOL levels are all found significant, therefore the Hypothesis that the Quality of life of the "Successful immigration" group is higher than the "Unsuccessful immigration" has been confirmed.

Study 2: Deep Poverty and Low- Medium Income Families in the same neighborhood:

Figures 4-5 presents the MDS maps of the two groups:

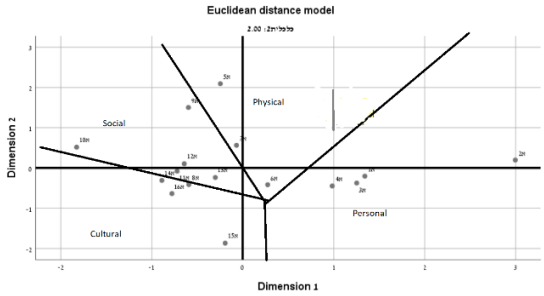


Figure 4. SQOL Map of Low-Medium Income Families

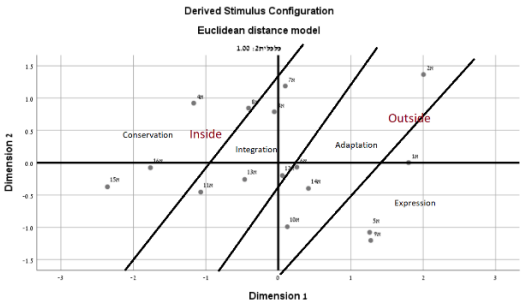


Figure 5. SQOL Map –Deep Poverty

As can be seen in the MDS figures, the Blue Collar group exhibits a clear partition between the subsystems, with the Physical and Personal Subsystems on the right and the Social and Cultural Subsystems on the left, exhibiting a Individual- Collective Partitions, The Deep poverty group, on the other hand, shows a partition of the Functioning modes and not the Subsystems With the Expressive and Adaptive functioning modes on the right and the Integrative and Conservative Modes in the left, such partition is called in previous research an "Inside- Outside" Partition (Barnetz 2009, 2013, 2015).

In order to examine the Hypothesis that the Quality of life of the "Successful immigration" group is higher than the "Unsuccessful immigration" group we conducted a series of T Tests, which can be seen in the table below.

	Personal	Physical	Social	Cultural	Total
Expression	T=5.75 Sig,0.001	T=3.80 Sig,0.001	T=2.96 Sig=0.01	T=3.76 Sig=0.001	T=5.42 Sig,0.001
Adaptation	T=4.48 Sig=0.001	T=5.41 Sig= 0.001	T=2.13 Sig=0.05	T=4.40 Sig=0.001	T=5.84 Sig=0.001
Integration	T=4.47 Sig= o.001	T=3.73 Sig= 0.001	T=2.70 Sig=0.01	T=2.63 Sig=0.01	T=4.62 Sig,0.001
Conservation	T=3.526 Sig=0.001	T=2.69 Sig=0.01	T=3.40 Sig=0.001		T=3.73 Sig,0.001
Total	T=4.9 Sig=0.001	T=5.0 Sig=0.001	T=2.45 Sig=0.05	T=3.03 Sig= 0.01	T=5.3 Sig=0.001

Table 2. T Scores and Significant Levels of Low- Medium vs. Deep Poverty

As can be seen in Table 2, the analysis found significant differences in 15 of 16 QOL cells, with the higher t values found in Cultural and Physical Adaptation, as well as Cultural and Personal Expression.

The Analysis for the Four Subsystems, the four functioning modes and overall QOL levels are all found significant, therefore the Hypothesis that the Quality of life of the "Blue Collar" group is higher than the "Deep Poverty" group has been confirmed.

Study 3: Combat reserve troops with low and high levels of legitimation:

Figures 6-7 presents the MDS maps of the two groups:

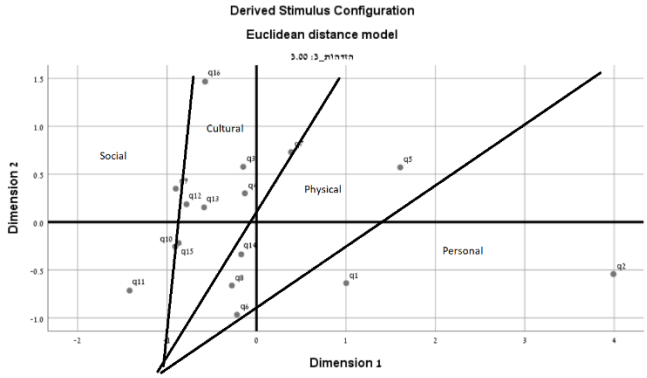


Figure 6. SQOL Map – High Legitimization

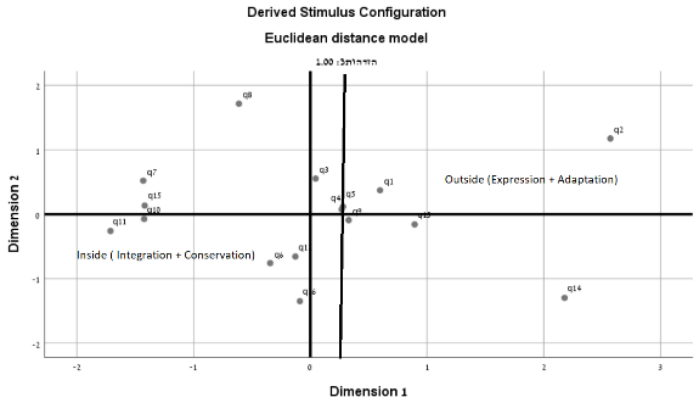


Figure 7. SQOL Map- Low Legitimation

As can be seen in the MDS figures, the High Legitimacy group exhibits a clear partition between the subsystems, with the Physical and Personal Subsystems on the right and the Social and Cultural Subsystems on the left, exhibiting an Individual- Collective Partitions. The Low Legitimacy group, on the other hand, shows a partition of the Functioning modes and not the Subsystems with the Expressive and Adaptive functioning modes on the right and the Integrative and Conservative Modes in the left (Inside- Outside Partition).

In order to examine the Hypothesis that the Quality of life of the "High Legitimacy" group is higher than the "Low Legitimacy" group we conducted a series of T Tests, which can be seen in the table below.

Table 3. T Scores and Significant Levels of High Vs Low Legitimacy

	Personal	Physical	Social	Cultural	Total
Expression				T=2.16 Sig=0.05	
Adaptation			T=2.3 Sig=0.05	T=4.27 Sig=0.001	T=3.04 Sig=0.01
Integration	T=2.0 Sig,0.05				
Conservation			T=2.4 Sig=0.05		T=2.39 Sig,0.05
Total			T=2.55 Sig,0.05	T=2.55 Sig=0.01	T=2.23 Sig= 0.05

As can be seen in Table 3, the analysis found significant differences in 5 of 16 qol cells, all in which the Qol of the High legitimacy group is higher than the Qol of the low legitimacy group, those cells are Personal Integration, Social Adaptation and Conservation, Cultural Expression and most notably Cultural Adaptation. The Analysis also found significant differences in the Social and Cultural Subsystems, In the Adaptive and Conservative Functioning modes and in the overall QOL levels. Therefore, the hypothesis that the Quality of life of the "Blue Collar" group is higher than the "Deep Poverty" Group has been confirmed.

Study 4: Arab and Jewish College Students in Israel:

Figures 8-9 presents the MDS maps of the two groups:

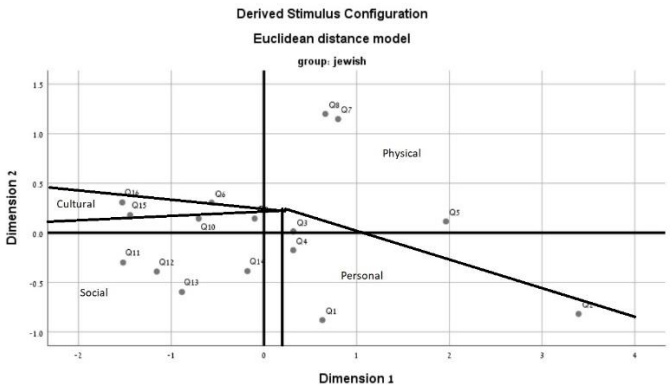


Figure 8. SQOL Map of Jewish Students

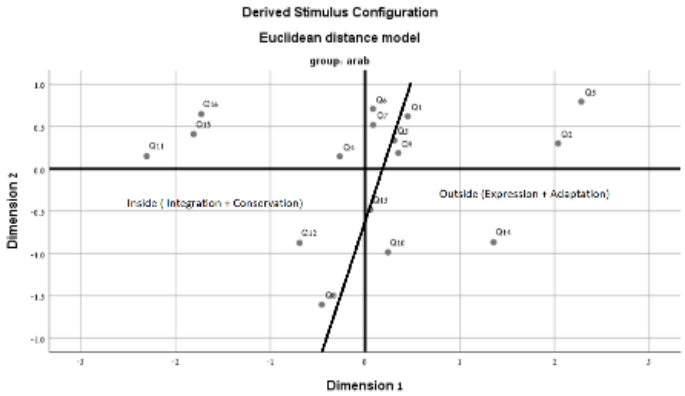


Figure 9. SQOL Map of Arab Students

As can be seen in the MDS figures, the Jewish Student group exhibits a clear partition between the subsystems, with the Physical and Personal Subsystems on the right and the Social and Cultural Subsystems on the left, exhibiting a Individual- Collective Partitions. It is important to note that out of the eight Qol Structures examined in the current research, this one is the most similar to Shye's (1985) "General Human System" theory that sees the most Effective Structure as an Angular structure with the personal Subsystem being polar to the Cultural Subsystem and the Physical Being polar to the Social Subsystem. The Arab Student's group, on the other hand, shows a partition of the Functioning modes and not the Subsystems with the Expressive and Adaptive functioning modes on the right and the Integrative and Conservative Modes in the left (Inside- Outside Partition).

In order to examine the Hypothesis that the Quality of life of the "Jewish Students" group is higher than the "Arab Student" group we conducted a series of T Tests, which can be seen in the table below.

Table 4. T Scores and Significant Levels of Jewish vs. Arab Students

	Personal	Physical	Social	Cultural	Total
Expression	T=7.62 Sig=0.001	T=7.26 Sig=0.001	T=10.37 Sig=0.001	T=11.28 Sig=0.001	T=12.56 Sig=0.001
Adaptation	T=5.58 Sig=0.001	T=7.30 Sig=0.001	T=10.52 Sig=0.001	T=13.20 Sig=0.001	T=12.80 Sig=0.001
Integration	T=6.90 Sig=0.001	T=6.60 Sig=0.001	T=5.66 Sig=0.001	T=6.66 Sig=0.001	T=9.25 Sig=0.001
Conservation	T=6.17 Sig=0.001	T=5.65 Sig=0.001	T=10.97 Sig=0.001	T=6.26 Sig=0.001	T=9.70 Sig=0.001
Total	T=8.24 Sig= 0.001	T=8.80 Sig= 0.001	T=12.30 Sig=0.001	T=12.65 Sig=0.001	T=12.21 Sig=0.001

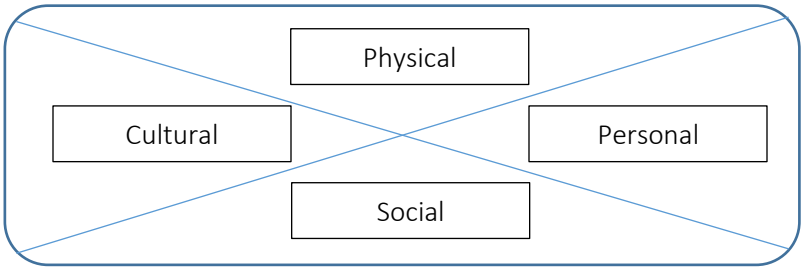
As can be seen in the Table above, the Analysis found Significant differences in all the 16 Qol cells, the four Subsystems, The four functioning modes and the overall Qol levels. As can be seen, this table is also, by far, the one that exhibits the higher T levels in the current research, with the T levels tending to be the highest for the "Collective" (Social + Cultural) and "Outside" (Expression + Adaptation) components.

Therefore, the hypothesis that the Quality of life of the "Jewish Students" group is higher than the "Arab Students" group has been confirmed.

DISCUSSION

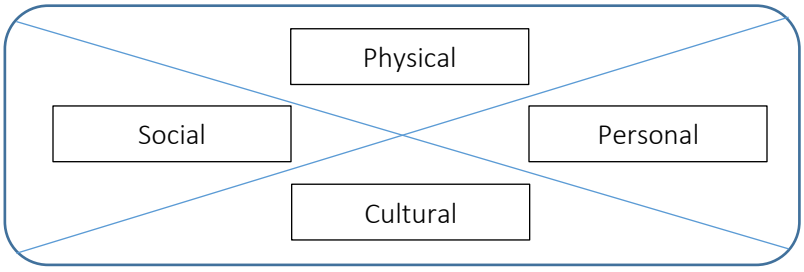
The current investigation verifies the hypothesis that there is a relationship between SQOL Structures and SQOL Levels, with SQOL structures that demonstrates a clear division between the subsystems having higher levels of SQOL than Structures that demonstrate a poor division between the Subsystems and an Inside / Outside Partition. In verifying this hypothesis, the current research provides an empirical support for a theoretical claim that plays an important role in the way researcher understood and interpreted their findings (see Beinish Weisman & Shye, 2011; Davidson- Arad & Wozner, 2001; Barnetz, 2009).

Looking at the results of the current study, however, can also help us lay forth a novel theory regarding the way deterioration in SQOL reflects in SQOL structures: The current study, combined with the theoretical foundation provided by the GHS model leads us to suggest a three levels model. We will illustrate it in the following figures and then elaborate on it. The Ideal SQOL Structure: The GHS Model is:



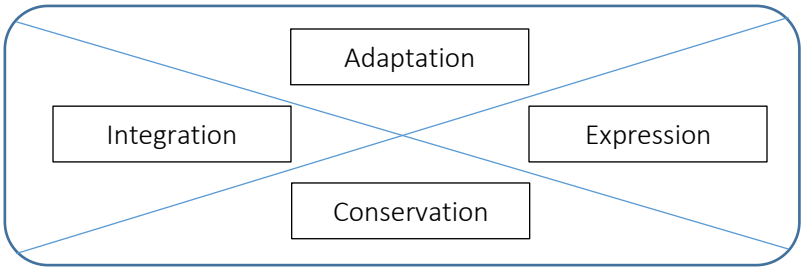
Basically, this Ideal Type is reflecting a balance between two axes: The first is the Individual (Personal+Physical) vs. the Collective (Social + Cultural) and the second axis is the Intra-Human (Personal+Social) vs. the Extra-Human (Physical+Cultural).

When life realities and challenges exert their toll on the individual, we will see a breaking of the GHS structure we will see a structure that is still based on the Subsystems, but with a greater regional proximity between the Cultural and Personal Subsystems (Davidson Arad & Wozner, 2001) as demonstrated below.



It is important to note that this structure still preserves the Individual (Personal + Physical) Collective (Social + Cultural) Division that is Found in the GHS.

With further deterioration, the Individual- Collective division collapses and we witness an Inside- Outside Partition:



This last structure has been the focus of three previous research (Barnetz 2009, 2013, 2015) which demonstrated the relationship of this structure to processes of Social exclusion and institutional injustice (E.G Racism, Poverty, and Peripherality). This notion stresses that further research on this subject might not only benefit our understanding of Human QOL but might also stress SQOL possible contribution to understanding and combating Social Injustice.

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COMMONALITIES OF VALUES AND MOTIVES: BEYOND THE BIG THREE

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ABSTRACT

We outline a parsimonious taxonomy for classifying motives, based on Schwartz's (1992) higher-order values *self-transcendence*, *conservation*, *self-enhancement*, and *openness to change*. This taxonomy is validated by re-analyzing the correlations between 17 of Murray's (1938) motives across 15 samples, using confirmatory multidimensional scaling (MDS). In this way, we complement former studies discriminating between the 'Big Three' - affiliation, achievement, and power - according to the motivational opposition 'self-enhancement vs. self-transcendence' (Bilsky & Schwartz, 2008). Furthermore, we resume earlier analyses that considered the opposition 'openness to change vs. conservation' as well, in order to specify a general taxonomy of human motives (Bilsky, 2006).

INTRODUCTION

Psychological value research and motivational research have developed largely independently of each other. This may be one reason, why there is little clarity about similarities and differences between the respective constructs until today. Another reason are different research traditions: Motivational research has concentrated primarily on single or few motives, while taxonomic approaches have only recently been discussed to a greater extent (e.g. Reiss, 2004; Forbes, 2011; Talevich et al., 2017). In value research, in contrast, the investigation of complex value structures has played a central role for several decades (e.g. Spranger, 1921; Schwartz & Bilsky, 1987).

Comparing variable labels and definitions used in motivational and in value research (e.g. dominance and power) suggests a considerable *overlap in content* between the respective constructs. If this applies, we would also expect to find *similar structures* for motives and for values. In order to verify this assumption, we chose the *higher-order values* of Schwartz's (1992, 2006) value model as a blueprint for a tentative taxonomy of motives, since this model has been validated in hundreds of studies. These values form two pairs of opposites: 'self-transcendence vs. self-enhancement' and 'openness to change vs. conservation'. In order to empirically test the appropriateness of this taxonomy, it seemed promising to re-analyze correlations between motives from published research. Such analyses can be accomplished by using multidimensional scaling (MDS). MDS represents the correlations as distances among points that mark these motives in (low-dimensional) geometric space (see Borg, Groenen & Mair, 2018).

However, there are not many studies covering different motives simultaneously, and even less studies use different motive measures (methods) at the same time. In case they do, they mostly focus on a special group of motives - the 'Big Three' *affiliation*, *achievement* and *power* (McClelland, 1987). Considering these motives, and taking the values model as a frame of reference, achievement and power motives are expected to be mutually compatible since both express *self-enhancement* goals. Affiliation, in contrast, is supposed to conflict with achievement

and with power because it expresses *self-transcendence* goals. Thus, when represented graphically, achievement and power motives should form adjacent regions, while affiliation is expected to form a separate region, opposite to achievement and power. This should hold, independently of the type of measurement used for assessing motivation (Borg, 1999).

Our assumptions on the opposition of *self-enhancement vs. self-transcendence* are depicted in Figure 1. They could be validated by re-analyzing Multi-Trait-Multi-Method correlation matrixes (Borg, 1999) of different motive measures and from different studies by means of ordinal MDS (see Bilsky, 1999; Bilsky & Schwartz, 2008, for detailed information). Yet, while in line with our tentative taxonomy of motives, these results do not show, whether or not the motivational opposition of *openness to change* and *conservation* also contributes to the clarification of the motive structure.

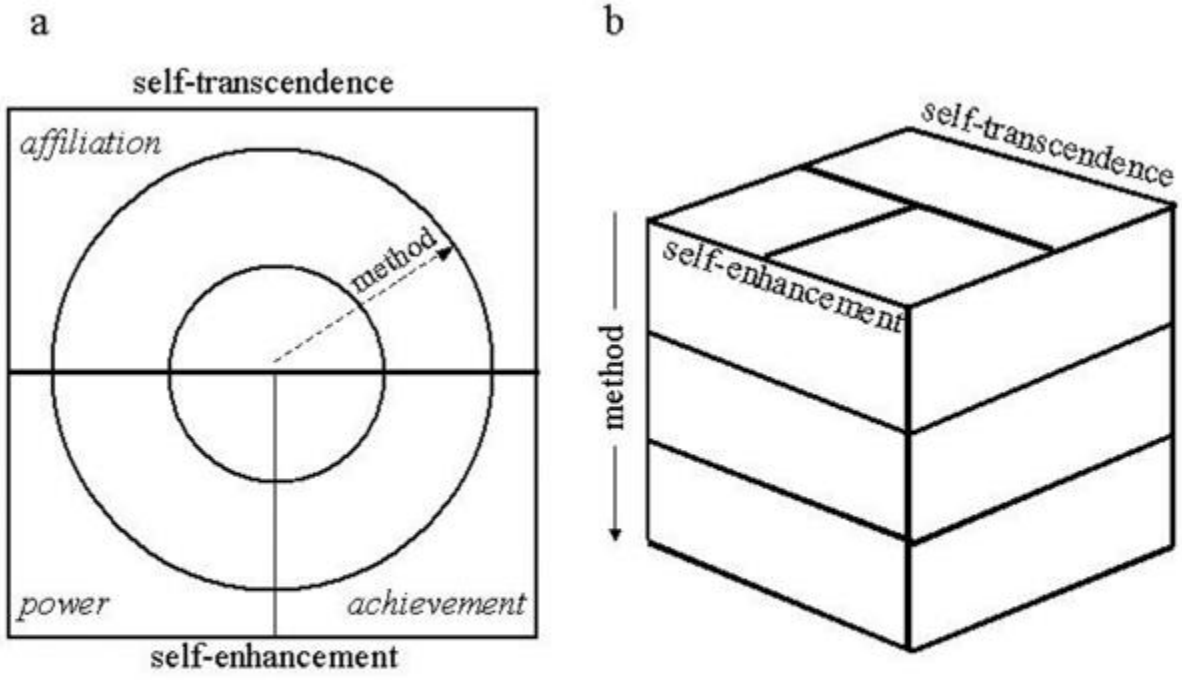

Figure 1
Hypothesized MDS structure of motives (affiliation vs. power and achievement) and assessment methods in two (a) and three (b) dimensions (cf. Bilsky & Schwartz, 2008)

BEYOND THE "BIG THREE"

In order to answer this question, we resorted to Murray's (1938) list of *motives* (called 'needs' in his writings; see, McClelland, 1987, for an overview). According to him, "a *need* is a construct … which stands for a force … which organizes perception, apperception, intellection, conation and action in such a way as to transform in a certain direction an existing, unsatisfying situation. A need is sometimes provoked directly by internal processes ..., but, more frequently … by the occurrence of one of a few commonly effective *press* ..." (pp. 123f).

Murray's needs are operationalized in Edward's (1959) Personal Preference Schedule (EPPS) and Jackson's (1974) Personality Research Form (PRF). Both instruments have been used in a great many international studies. In the PRF, the respondents' task is to assess every statement (item) in terms of approval/rejection. Thus, approving "I feel confident when directing the activities of others" or "The ability to be a leader is very important to me" would indicate Dominance. Confirming "I would rather have a job serving people than a job making something" or "People like to tell me their troubles because they know I will help them", on the other hand, are indicators of Nurturance. The EPPS, in contrast, uses a forced-choice format, in which the respondents have to choose for every item between two statements of different motivational content. For example "I like to be successful in things undertaken" vs. "I like to form new friendships", involves choosing between Achievement and Affiliation.

Starting out from exploratory analyses of Bilsky (2006), Janik (2013) searched the literature for studies reporting the inter-correlations of motives that were assessed with either of these instruments. He identified 16 published studies, reporting correlation matrixes for 24 samples with a total N=15,327. Of these studies, 13 applied the PRF and three the EPPS (p. 50).

Next, he ran a qualitative pilot study, which served two purposes: The first was to verify that the PRF- and the EPPS-variables correspond to the motives as defined by Murray. These comparisons were made on a definitional and an operational (item) level; misfits were excluded from further analyses (pp. 51ff). The second purpose was to match the remaining motives with Schwartz's basic and higher-order values (pp. 67ff). Overall, Janik identified 16 matches of motives and values, 15 of them concerning PRF- and 11 EPPS-variables (p. 71).

On a final step, Janik re-analyzed the 24 correlation matrixes individually by means of confirmatory MDS (p. 72ff). This was accomplished by using a theory-based starting configuration referring to the four higher-order values (pp. 81ff), and by applying different types of regional constraints to the motivational data. These constraints were derived from the postulated compatibilities and conflicts between Schwartz's higher-order values and applied to PRF- and EPPS motives according to their correspondence with values determined in the pilot study (see Figure 2).

Overall, the results of Janik's analyses demonstrate convincingly that the correlational pattern of self-attributed motives can be mapped in two dimensions in accordance with Schwartz's higher-order values (Janik, 2013, p. 136). This holds likewise for oblique and for orthogonal constraints. However, as the number of variables considered per study varies between 9 and 20, results cannot be compared easily.

In order to avoid this problem, we concentrate in the following on the eight most comprehensive studies, which comprise 15 samples covering 20 identical variables each. All of these studies used the PRF. Methods and results of re-analyzing the inter-correlations between variables are outlined next. The concluding discussion deals with the pros and cons of the present approach.

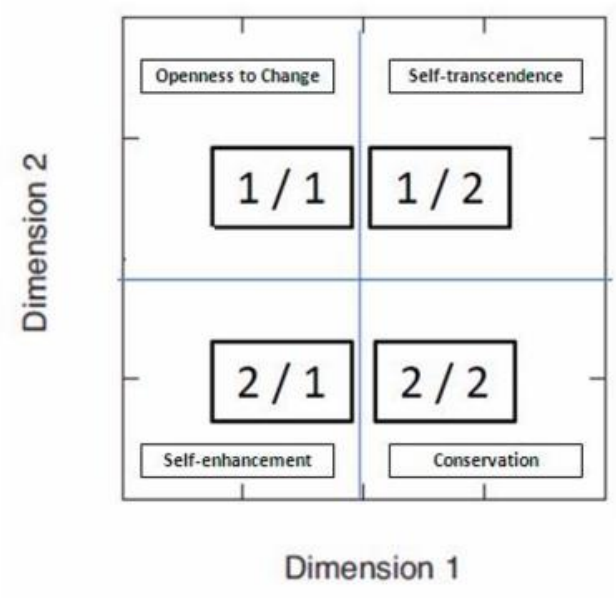

Figure 2

Regional Axial Constraints for Confirmatory MDS (cf. Janik, 2013)

METHOD

Variables, Studies and Samples

Variables

The 20 variables considered here include 17 motives and 3 general traits as distinguished by Murray (1938). Of these motives, 13 could be assigned to the four higher-order values without reservation, while for two others, exhibition and succorance, assignments were less clear (Table 1, lines 1-4). The remaining motives cognizance and recognition have been of minor importance in Murray's (1938) work and have not been classified, therefore. In addition to the above motives, three general traits, change, endurance, and impulsivity, are also covered by the PRF and included in the analyses. This allows the reader, where appropriate, to make cross-references between values and personality too (cf. Bilsky & Schwartz, 1994, in a similar context). Table 1 gives an overview of all 20 variables.

Studies and Samples

Altogether 15 samples from eight studies, covering 20 identical variables each and based on N=12,513, were re-analyzed. They include female and male participants of different age. These studies were conducted in the United States of America, Canada, the Netherlands, and in Germany (former Federal Republic, FRG), using different forms of the PRF (see Janik, 2013, p. 50). As the majority of participants were either students or members of the army, the samples are not representative of the respective country. Table 2, columns 1-3, give an overview of the studies and samples.

Table 1
Variables measured with Jackson's (1974) Personality Research Form, and motives matched with Schwartz's higher-order values (cf. Janik, 2013)

Higher-Order Values (Schwartz, 1982)	**Motives (Murray, 1938)**
Self-transcendence	Affiliation (Af), Nurturance (Nu)
Conservation	Abasement (Ab), Harmavoidance (Ha), Order (Or), Succorance (Su)*
Self-Enhancement	Achievement (Ac), Aggression (Ag), Defendance (De), Dominance (Do), Exhibition (Ex)*
Openness to Change	Autonomy (Au), Play (Pl), Sentience (Se), Understanding (Un)
Unclassified	Cognizance/Cognitive Structure (CStr)** and Recognition/Social Recognition (SocRe)**
** tentative classification (Janik, 2013, p. 71)* *** these motives were only occasionally mentioned by Murray (1938)*	
General Traits: Change (Ch), Endurance (En), Impulsivity (Im)	

Table 2
PRF-based Studies, reporting correlations of 17 motives and 3 general traits (columns 1-3); Stress-1 values from confirmatory MDS, enforcing a fourfold split of variables in two dimensions analogous to Schwartz's higher-order values (columns 4 and 5; cf. Janik, 2013)

PRF-Studies[a]	**Sample**	**N**	**confirmatory MDS* Stress-1** [b]	
			orthogonal	oblique
Jackson (1974, Tab. 15)	F, Students (USA)	1002	.21	.20
	M, Students (USA)	1029	.23	.21
Jackson (1974, Tab. 22)	F, Students (USA)	115	.21	.21
	M, Students (USA)	100	.21	.20
Jackson (1974, Tab. 23)	Pupils, classes 7-11 (USA)	1862	.18	.18
	M, Can. Forces (USA)	2215	.18	.18
Lei & Skinner (1982)	M, Can. Forces (engl.)	1465	.21	.22
	M, Can. Forces (french)	695	.20	.19
Schulkens et al. (1974)	F, Students (NL)	147	.23	.23
	M, Students (NL)	165	.24	.23
Skinner et al. (1976)	M, Can. Forces (engl.)	2141	.20	.19
	M, Can. Forces (french)	1040	.17	.17
Stricker (1974)	Pupils, classes 11/12 (USA)	71	.23	.23
Stumpf (1978)	M, Forces (FRG)	233	.23	.22
	M, Forces (FRG)	233	.24	.24

[a] Janik (2013): excerpts from Tables 11 (p. 50) and 25 (p. 89)
[b] Mean stress values for 20 random points in two dimensions = 0.30 (Spence & Ogilvie, 1973, p. 515)
*without constraints for Exhibition and Succorance

Data Analysis

Structural analyses were accomplished by means of ordinal multidimensional scaling (MDS) in two dimensions, using regional constraints for identifying orthogonal and oblique solutions of motive structure. These constraints referred to 13 or 15 motives, depending on whether exhibition and succorance have been considered (Janik, 2013, p. 89).

When starting our structural analyses, there existed no standard software, which would allow testing value or motive structures by confirmatory MDS. Therefore, we used an experimental program written in MatLAB by Groenen. This program had already been used for similar purposes in earlier studies (e.g. Borg et al., 2011; Bilsky et al., 2015). To find an MDS solution that matches the assumed correspondence between motives and higher-order values as closely as possible, we used a theory-based starting configuration derived from Schwartz's model of value structure (see Borg et al., 2018, p.78ff; Bilsky & Janik, 2010; Janik, 2013).

In order to benchmark the stress values resulting from our structural analyses, we referred to a table of expected stress values provided by Spence and Ogilvie (1973). This table covers the range from 12 to 48 objects (points) for one to five dimensions.

RESULTS

For the sake of brevity and clarity, we limit ourselves here to the presentation of results of confirmatory MDS analyses, which used regional constraints for only those 13 PRF-variables that could be unambiguously assigned to the four higher-order values (see Table 1 and Janik, 2013, pp. 88ff, for a complete overview of results).

Figure 3 shows the two-dimensional plot of a confirmatory MDS with orthogonal constraints, run on correlations reported by Stricker (1974). Motives assigned in the qualitative pilot study to one of the four higher-order values are marked by circles, which differ in color depending on the respective assignment. The orthogonal separation lines are imposed by the confirmatory MDS. They form four quadrants, each containing the motives assigned to one of the four higher-order values. Self-transcendence and self-enhancement are opposite each other as are openness to change and conservation. The Stress-1 value of this solution is .23 and thus significantly below the mean stress value for 20 random points (see Spence & Ogilvie, 1973). An analogous plot for a confirmatory MDS of motives assessed by means of the EPPS is given in Figure A1 in the Appendix for illustrative purposes.

Columns 4 and 5 of Table 2 summarize the stress-1 values for 15 confirmatory MDS analyses with orthogonal and oblique solutions. As can be seen from this table, the stress-1 values for all of them clearly fall below the stress value for 20 random points in two dimensions (Spence & Ogilvie, 1973). For complementary findings and more detailed analyses, see Janik (2013).

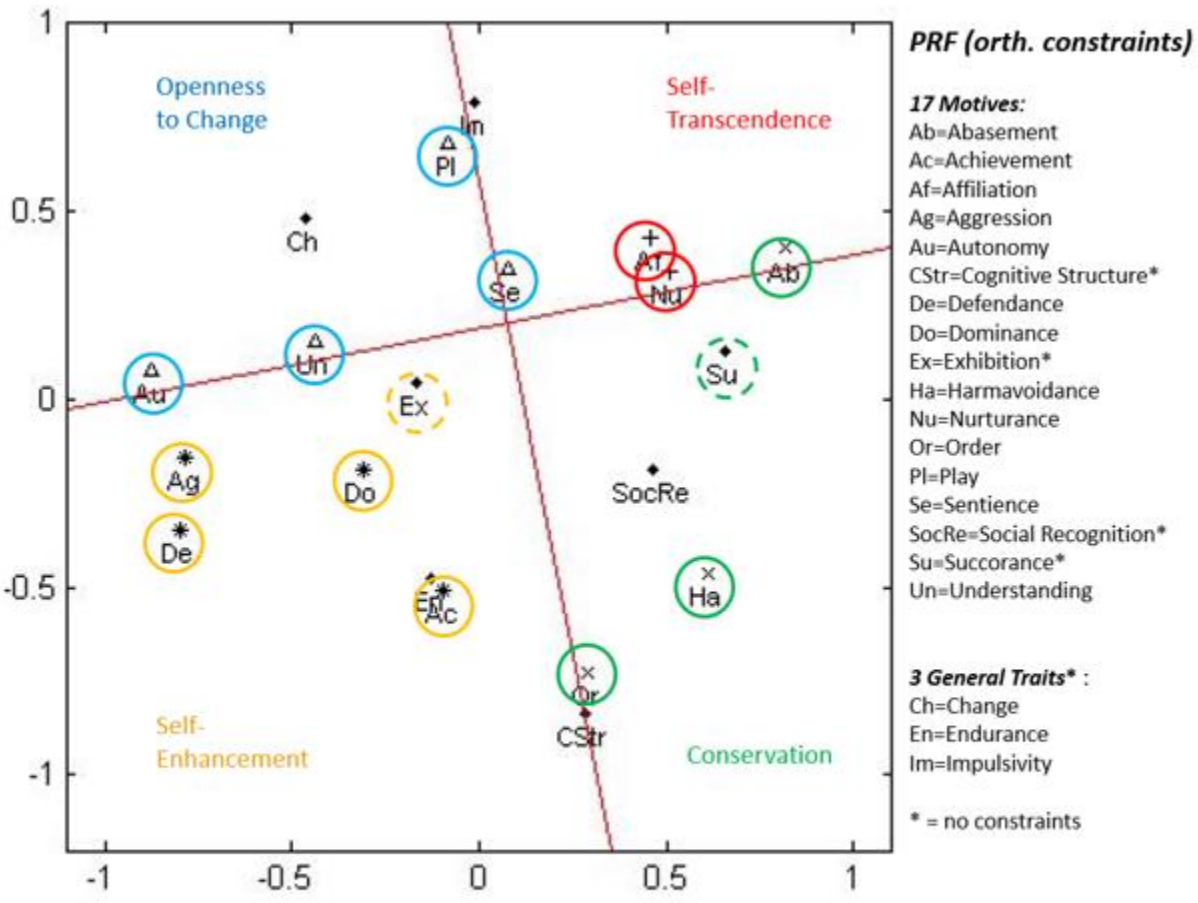

Figure 3
Two-dimensional ordinal MDS of PRF variables (Stricker, 1974) with regional axial constraints (cf. Janik, 2013; Bilsky, 2019)

SUMMARY AND DISCUSSION

In our prior studies on the structure of motives (Bilsky & Schwartz, 2008), we investigated the relation between affiliation, achievement and power - the so-called 'Big Three' in motivational research - by using Schwartz's (1992) values model as a template. Reanalyzing Multi-Trait-Multi-Method matrices from different studies, we could demonstrate that the relation between these motives matches the opposition of 'self-enhancement' and 'self-transcendence' values.

The study of Janick (2013) complements this earlier research. It focuses on Murray's (1938) motives measured with the Personality Research Form (PRF) and with Edward's Personal Preference Schedule (EPPS). This means that, in addition to affiliation, achievement and power/dominance, further motives like abasement, harmavoidance, autonomy or play were considered. The values model served again as a blue print for the structural analyses of these motives. Given the broad spectrum of motivational content, Janick expected to identify a four-fold

structure of motives, characterized by the oppositions 'self-transcendence vs. self-enhancement' and 'openness to change vs. conservation', as outlined in Figure 2. To validate this hypothesis, he re-analyzed the correlations between motives by means of confirmatory MDS. In total, correlation matrices of 24 samples from 16 studies very analyzed. The structures found corresponded mostly to expectations: For 20 out of 24 samples the analyses showed a satisfactory stress thus confirming that the correlational pattern of motives could be mapped in two dimensions in accordance with the hypothesized four-fold structure. These results are consistent with those from previous exploratory studies based on different data (Bilsky, 2006).

However, as the number and the included motives partly differ between the above studies, deviating results with respect to stress cannot be interpreted easily. Therefore, we selected those eight studies for the present review that match with respect to the variables considered. These studies comprise 15 samples and include the largest number of common variables, i.e. the same 17 motives and 3 general traits. For all of these samples we were able to show that the stress values of the confirmatory MDS analyses are consistently well below the mean stress value for 20 random points reported by Spence and Ogilvie (1973).

Altogether, we conclude therefore, that Schwartz's (1992) two-dimensional values model can serve as *a general and parsimonious taxonomy* for describing the structure of motives and, thus, as a conceptual frame for investigating the relationship between values and motives in subsequent studies. Although Janick's (2013) analyses are exclusively based on self-report data, this conclusion seems justified, since comparable motivational structures have been identified in prior studies, independently of the type of assessment instruments applied (Bilsky & Schwartz, 2008).

However, some *caveats and limitations* of our analyses need mentioning. First, all studies cited here are from around the seventies of the last century. Unfortunately, we did not find recent research that covers a broad spectrum of motives within the same study. One might argue, of course, that the type and impact of motives may change over time without necessarily affecting their overall structure. Nevertheless, validating our findings with current data would seem desirable.

Second, all of our analyses are based on highly aggregated data, that is, on correlation matrixes. This means that these findings relate to the 'mean person', which may differ considerably from concrete individuals. Therefore, future studies should pay more attention to the individual when analyzing motivational structures. This presupposes, however, that statistical analyses are not based on correlation but on data matrixes. Using multidimensional unfolding (Borg et al., 2018), for example, would enable the researcher to identify an individual's position within an interpersonally valid structure of values or motives. Yet, such studies are still rare.

Finally, having identified *overlaps* in the content and structure between values and motives, another no less important question arises as to their *delimitation*: What makes the difference between both constructs – if any?

Unfortunately, nominal definitions do not help in answering this question but give, at best, some vague orientation. Thus, according to the APA Dictionary of Psychology, *motives* "are frequently divided into (a) physiological, primary, or organic motives, such as hunger, thirst, and need for

sleep; and (b) personal, social, or secondary motives, such as affiliation, competition, and individual interests and goals" (https://dictionary.apa.org/motivation). Focusing on this second meaning of motive, we would have to distinguish it from *value*, which denotes "a moral, social, or aesthetic principle accepted by an individual or society as a guide to what is good, desirable, or important" (https://dictionary.apa.org/value).

Even a glance at the standard literature on motivation does not lead much further. McClelland (1987, p.590), for instance, quotes a "working definition of a motive as a recurrent concern for a goal state based on a natural incentive – a concern that energizes, orients, and selects behavior" – which requires clarifying of defining terms like "concern" or "goal state" on another second or third step. In an attempt to distinguish motives from values, he states that "values are much more affected than motives by social norms and by societal and institutional demands" (p. 522) and, in another context, that the term value "has come to be used to describe normative beliefs about desirable goals and modes of conduct …" (McClelland, Koestner & Weinberger, 1989, p. 690).

This latter citation points to another, fundamental problem of value definitions, discussed in detail by Scholl-Schaaf (1975). She states after a careful analysis of several nominal definitions, that it is "not possible to define the notion of value without presupposing it in the definiens, i.e. without getting into *a circular definition*" (p. 58). In this context, she quotes Kluckhohn's frequently cited value definition as an example: "a conception, explicit or implicit, distinctive of an individual or characteristic of a group, of the desirable [sic!] which influences the selection from available modes, means and ends of action" (Kluckhohn, 1951, p. 395).

To avoid this type of problems, Borg et al. (2019, p.2) recently suggested a mapping sentence for defining values in terms of *value items*:

"An item belongs to the universe of value items if and only if it satisfies the following blueprint: The social unit:={person p; group g} in context:={c} when confronted via method:={observation; interview; questionnaire; experiment} with object:={situation s; behavior b} of life area:={work; health; family; education; economy; leisure; social; …; in general} *responds* in modality:={cognitive} expressing that it is {{not important;…;very important} that the object {does; does not} exist} for purpose:={unspecified; instrumental i; terminal t} of reference group:={person q; group h; company C; …}."

In this sense, *value items* are assessed in terms of their *judged importance for some purpose*, whereas, the range of *attitude items*, for example, is often specified as *very negative to very positive towards some object.* (Borg et al., 2019)

However, applying this mapping sentence to the distinction of *motives* and *values* will not be possible without modifications. This results from the breadth of measures used for assessing motives, which extends from projective methods (e.g. TAT), ideographic wishes and personal strivings to questionnaires (e.g. PRF and EPPS) and self-ratings (cf. Bilsky & Schwartz, 2008). Murray (1938) himself stressed the importance of this breadth. Thus, he notes, "a need manifests itself in a variety of ways", and concludes, "it is not possible to confine oneself to a single operational definition" (Murray, 1938, p. 125). Furthermore, in view of the close interrelation of *needs* and *press* (Murray, 1938) and of *values* and *norms* (e.g. Hermann, 2003), considering the

conditions under which motives and values become effective might help to identify distinguishing features, too. However, pursuing these considerations further goes beyond the scope of this paper.

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APPENDIX

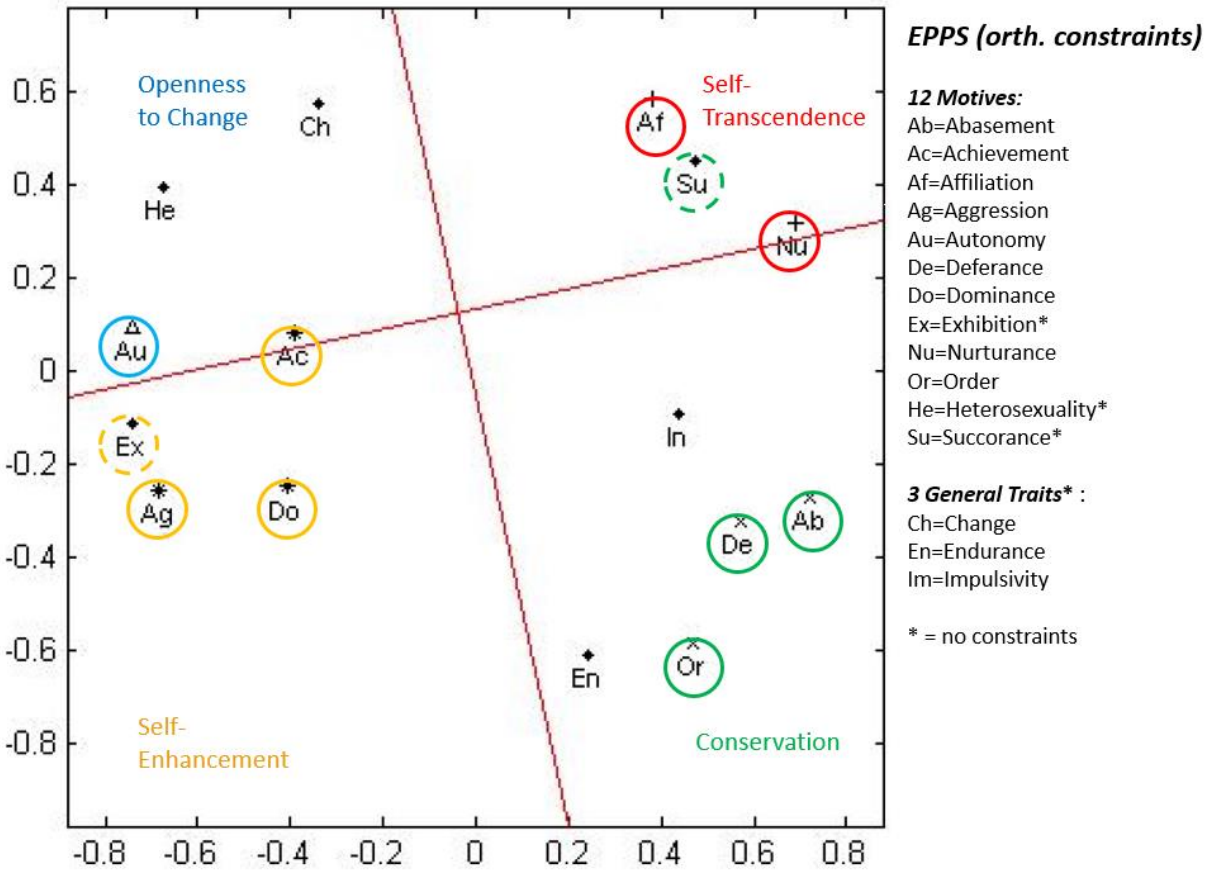

Figure A1. Two-Dimensional Ordinal MDS of EPPS Variables (Manners & Steger (1975) with Regional Axial Constraints (cf. Janik, 2013; Bilsky, 2019)

THE RADEX THEORY OF UNIVERSAL VALUES BASED ON THE SYSTEMIC QUALITY OF LIFE MODEL: A REPLICATION IN THE ISRAELI ARAB SOCIETY

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ABSTRACT

Shye's radex theory of universal values, based on the Systemic Quality of Life model (SQOL), is used to investigate the values held by an Israeli-Arab sample of 43 participants. Hypotheses that ensue from the systemic foundations of the SQOL-Value theory are tested and supported. Values were found to have the Radex structure with the functioning subsystems: personality, physical, social, and cultural playing an angular role (forming a circumplex); and the sub-systemic modes: expressive, adaptive, integrative and conservative playing a radial role (ordered with the conservative mode at the center). This essentially replicates the radex theory of SQOL universal values. POSAC performed on the Israeli-Arab sample showed disparities between the coordinate-scales derived here and those derived in the previous Israeli-Jewish sample.

INTRODUCTION

The Systemic Quality of Life model (SQOL) universal value theory has been introduced by Shye (2009) as an alternative to Schwartz's theory of values (Schwartz, 1992), having the following advantages:

- ✓ SQOL Universal Value Theory starts with a top-down definition of *value*, based on a comprehensive theory of human quality of life.
- ✓ It identifies 16 SQOL values that are exclusive and exhaustive (Shye, 1989), an essential feature for theory and measurement; and
- ✓ It yields empirical results that support a complete radex theory of values: a radial facet (a set of simplexes of human functioning modes) as well as an angular facet (a circumplex of human functioning systems).

Aristotle considered Happiness (εὐδαιμονία) as the Ultimate Purpose of Human Existence; a final goal that encompasses the totality of one's life. Unlike its modern conception as a subjective and transient quality, happiness is the ultimate value as a universal human functioning mode. Today's notion of Quality of Life properly defined, may well be considered as a successor to EUDAIMONIA: an ultimate value, and a basis for universal value research.

THE SYSTEMIC QUALITY OF LIFE THEORY (SQOL)

Quality of life (QOL) is a multidimensional construct that consists of the evaluation of an individual of the different aspects of their life. This evaluation is influenced by the values, goals, and socio-cultural context in which the individual lives, and includes, amongst others, physical health, family, safety, cultural beliefs, and the environment (Nussbaum & Sen, 1993; Gregory, D. et al., 2009). What makes it challenging to measure QOL is that, although it has importance for nearly everyone and every academic discipline (Seed and Lloyd 1997), individuals and groups

define it differently and researchers have developed different techniques to conceptualize and measure QOL's multiple domains (Sullivan 1992). Taillefer et al. (2003) reviewed a variety of QOL models that had been published between 1965 and 2001 and evaluated them based on the level of conceptualization of the model, definitional clarity, distinction between factors that influence QOL and QOL itself, and the presence of instruments for measuring QOL. Shye's (1989) systemic life quality model (SQOL) was rated first among the 68 reviewed models (Taillefer et al. 2003).

The Systemic Quality of Life model (SQOL) is based on a more general faceted framework for the functioning of action systems (Shye, 1989). The conceptual notions that emerge from the faceted model for action systems can be applied to a specific action system -the individual human being, and to a specific universe of events- events that relate to the QOL of the human being. Indeed, the systemic life quality model that was introduced in (Shye, 1975) allows us to systematically examine the entire span of the QOL in the individual and the model's consistency and reliability were demonstrated in (Shye, 1979). It defines QOL as the effective functioning of the individual in each of 4x4 modes. The model defines the subsystems of function and the modes of function as two distinct facets of the person's QOL. The subsystems are the psychological, physical, social, and cultural. The modes are the way the individual functions in each field. They are the expressive, adaptive, integrative, and conservative modes (see figure 1).

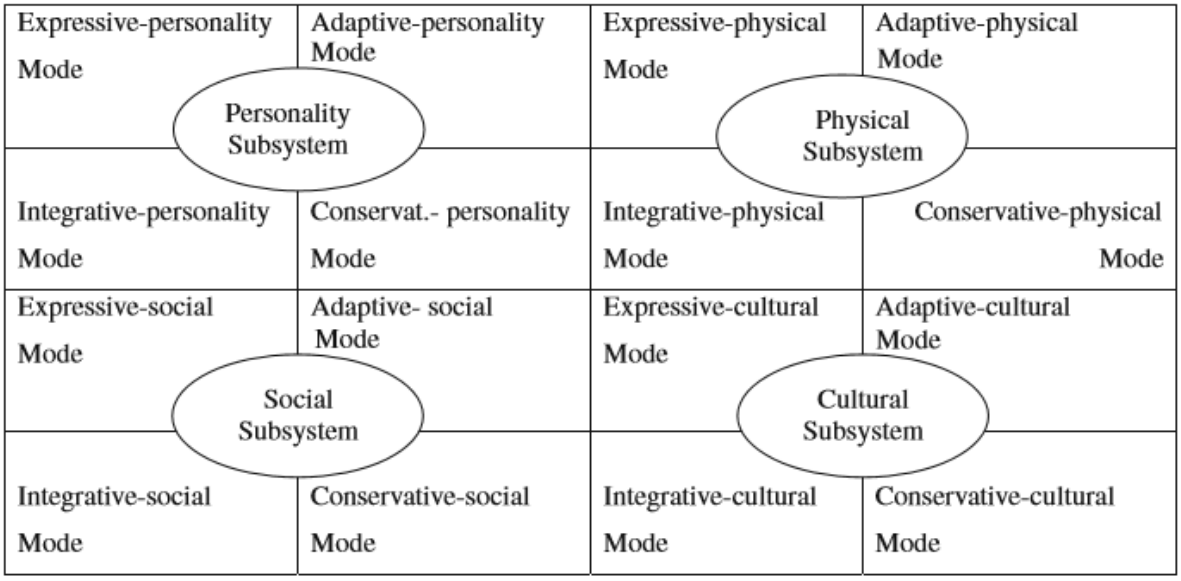

Figure 1: 4x4 Modes of the Two Facets of the Systemic Quality of Life Model

An interpretation of the 16 functioning modes is presented in Table 1.

Table 1. The 4x4 Modes of the Two Facets of the Systemic Quality of Life Model

Subsystem Mode	Personal	Physical	Social	Cultural
Expressive	**1** Self fulfillment	**5** Physical abilities & control of environment	**9** Social status	**13** Expression of values & beliefs
Adaptive	**2** Rest & recreation	**6** Comfortable physical conditions incl. air, food & shelter	**10** Relations with institutions (governmental, work, services etc.)	**14** Relations with cultural environment incl. cultural institutions & means
Integrative	**3** Mental well-being	**7** Physical health	**11** Close interpersonal Relationships	**15** Integration between different values
Conservative	**4** Self confidence	**8** Physical confidence	**12** Social belonging	**16** Cultural belonging

The model's general and structured quality makes it applicable to different populations, in different situations, and in different cultures. It has been used to evaluate the QOL in a work setting in Israel (Elizur and Shye, 1990), to accompany deprived neighborhood in Israel undergoing urban renewal (Shye, 1989), to assess life quality of Russian immigrants to Israel and their pattern of success and unsuccess integration (Benish-Weisman & Shye, 2010), and to identify de-facto for criteria for removing children at risk from their homes (Arad & Wozner, 2001).

SQOL-BASED THEORY OF UNIVERSAL VALUES

The 16 SQOL functioning modes can also serve as a basis for a theory of universal values, where values held are assessed by the importance attributed by people to each SQOL component (functioning mode). This novel use of the SQOL model to study values has already been implemented (Shye, 2009) in a Jewish Israeli sample. A random representative sample of 1168 respondents were presented with a questionnaire on their SQOL-based values and the empirical results reflected the suitability of the SQOL model in measuring QOL values. Values were found to have a radex structure with the functioning subsystems (personality, physical, social, and cultural) playing an angular role (with the personality subsystem opposite the social subsystem and the physical subsystem opposite the cultural subsystem.); and the sub-systemic modes (expressive, adaptive, integrative and conservative) playing a radial role (ordered with the conservative mode at the center and the expressive mode at the periphery).

CURRENT RESEARCH

Since the SQOL model is derived from culture-free theoretical assumptions, the proposed SQOL-based value theory claims to be universal, therefore it should be applicable to any group of interest for research. QOL values in the general population of any country are of interest, as the knowledge of these values can optimize the mutual relations between the state and its citizens and help to better shape public policy and direct funding for example. QOL values in minority groups are of a particular interest, as these groups can differ in their QOL values and QOL needs than other

majority groups and are often disadvantaged. Specifically, the question of QOL values and their importance in the Israeli Arab population remains largely unexplored. In this paper I want to examine the importance of different values of QOL in the Arab minority in Israel using Shye's systemic quality of life model to measure QOL values.

HYPOTHESES

Sign of the correlation coefficient

All statistical correlation coefficients in the 16-item matrix of SQOL values would be nonnegative, because these values are derived from a systemic conception that assumes the QOL item set as belonging to a unified, coherent conceptual entity.

SQOL-Based Values Structure

Our Israeli-Arab sample will display the classical structure of the SQOL model. In a spatial representation of observed interrelationships conducted by Faceted Smallest Space Analysis (FSSA1) among SQOL-based values variables, the personality subsystem would appear opposite the cultural, and the social subsystem opposite the physical, and they will play an angular role (forming a circumplex). Moreover, the functioning mode facet will display a radial role, where the conservative mode will constitute the inner circle and the expressive mode will constitute the outer circle (Shye, 2009).

METHODS

Participants

A random sample of 43 adults from an Israeli-Arab town filled an online questionnaire. Of the sample, 86% were females, and 65% were 18–34 years old and 35% were 35–65 years old.

The Questionnaire

A questionnaire of the 16 systemic functioning modes, drawn from the SQOL model and adjusted to measure SQOL values, had been formulated and used by Shye before (Shye, 2009). This questionnaire was translated to Arabic and back to English by two independent native Arabic speakers in order to rule out any linguistic disparity in formulation. Each question was rated by the participants on a 1 to 6 Likert scale; 1 signifying little to no importance, and 6 extreme importance. The questionnaire contained two additional questions about gender and age.

RESULTS

Descriptive Statistics

The mean and the standard deviation of each question representing a certain score for each one of the four subsystems (personality, physical, social, cultural), and of each one of the four systematic

functioning modes (expressive, adaptive, integrative, conservative), as well as the grand mean and standard deviation were calculated (see Table 2).

Table 2. Descriptive Statistics of the Results of the Survey

		Personality	Physical	Social	Cultural	Total
Expressive	Mean	4.26	3.3	3.84	3.79	**3.8**
	SD	1.2	1.059	1.045	1.15	**1.15**
Adaptive	Mean	3.98	4.12	3.56	3.81	**3.87**
	SD	1.08	1.26	1.22	1.12	**1.18**
Integrative	Mean	3.95	4	3.79	3.72	**3.87**
	SD	1.43	1.36	0.2	0.2	**1.2**
Conservative	Mean	3.67	4.12	3.63	3.44	**3.7**
	SD	1.44	1.16	1.22	1.14	**1.26**
Total	Mean	3.97	3.88	3.7	3.7	**3.81**
	SD	1.3	1.25	1.12	1.1	**1.2**

Faceted SSA

Faceted SSA examines our data from a qualitative perspective. It aims to examine the meaning of the different SQOL value questions. It partitions the space of SQOL values, provides a geometric depiction of it, and tests the existence of its hypothesized facets. First, FSSA optimally maps all observed variables as points into a geometric space where the higher the correlation between any two variables, the closer they are in the map (for the correlation coefficients matrix see appendix 1). Second, FSSA attempts to find a correspondence between our hypothesized conceptual categories of QOL values, and regions of the space obtained by simple partition patterns. Thus, the program can test for our specific structural hypotheses (see Shye, 2014a for more details).
In the Israeli-Arab sample, all signs of the coefficient matrix are positive, except for the correlation between item 3 and item 12 which is -0.02 (see appendix 2 for the coefficient matrix). This is a slight deviation, and the overall matrix fits the hypothesized outcome.

In the two-dimensional FSSA, our hypothesis is clearly supported with the subsystem facet playing an angular role (forming a circumplex) wherein the personality subsystem is opposite the cultural, and the social subsystem is opposite the physical. There is one deviating point (item 12) and the Separation Index is .9236, which is considered high (see figures 4 and 5).

SERIAL NUMBER	FACETS 1	2
1	1 PERSONALITY	1 EXPRESSIVE
2	1 PERSONALITY	2 ADAPTIVE
3	1 PERSONALITY	3 INTEGRATE
4	1 PERSONALITY	4 CONSERVATIVE
5	2 PHYSICAL	1 EXPRESSIVE
6	2 PHYSICAL	2 ADAPTIVE
7	2 PHYSICAL	3 INTEGRATIVE
8	2 PHYSICAL	4 CONSERVATIVE
9	3 SOCIAL	1 EXPRESSIVE
10	3 SOCIAL	2 ADAPTIVE
11	3 SOCIAL	3 INTEGRATIVE
12	3 SOCIAL	4 CONSERVATIVE
13	4 CULTURAL	1 EXPRESSIVE
14	4 CULTURAL	2 ADAPTIVE
15	4 CULTURAL	3 INTEGRATIVE
16	4 CULTURAL	4 CONSERVATIVE

Figure 2: A Two-Facet Key for Items Included in the FSSA

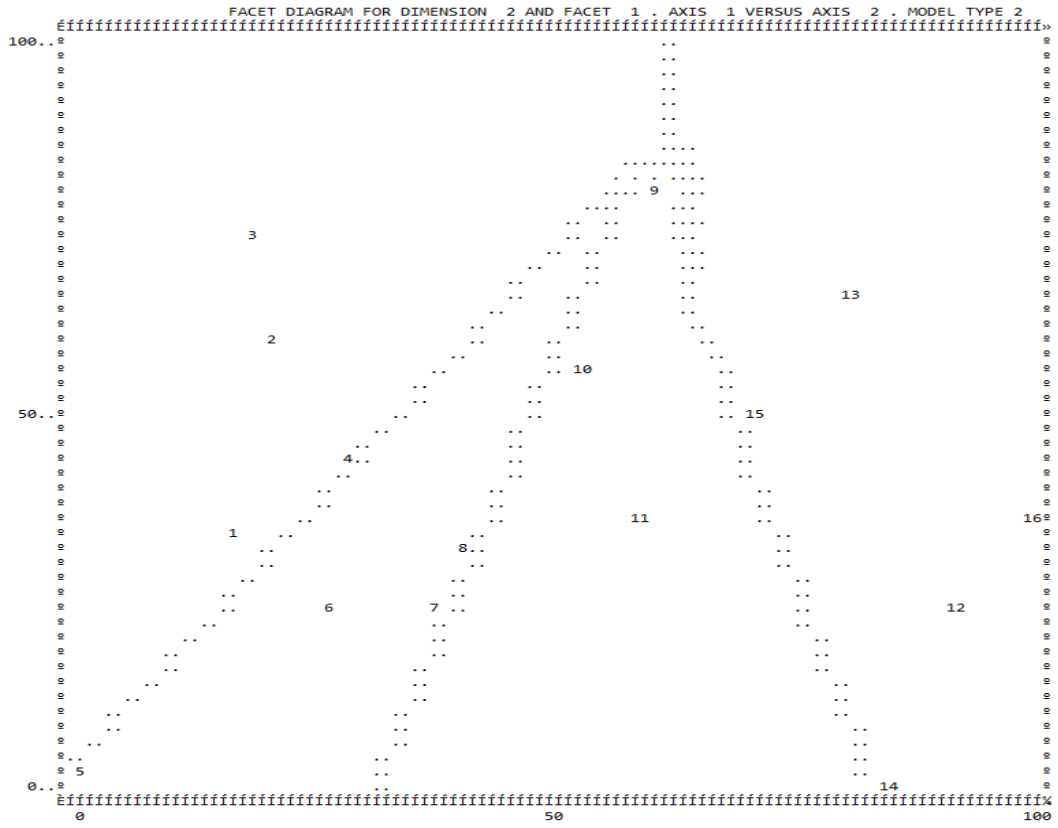

Figure 3. Angular Partitioning of SQOL Values Space by Subsystem Facet

In the two-dimensional FSSA, our hypothesis that the functionality mode facet will display a radial role is not supported and the separation index for 8 deviating points is 0.5536, which is considered low. This agrees with previous findings in the field (Shye, 1989), where the functionality mode facet is often supported only in higher dimensionalities. Looking at the data in a three-dimensional

FSSA, the axis 1 x axis 3 map shows a reasonable separation, with four deviating points. (See Figure 4).

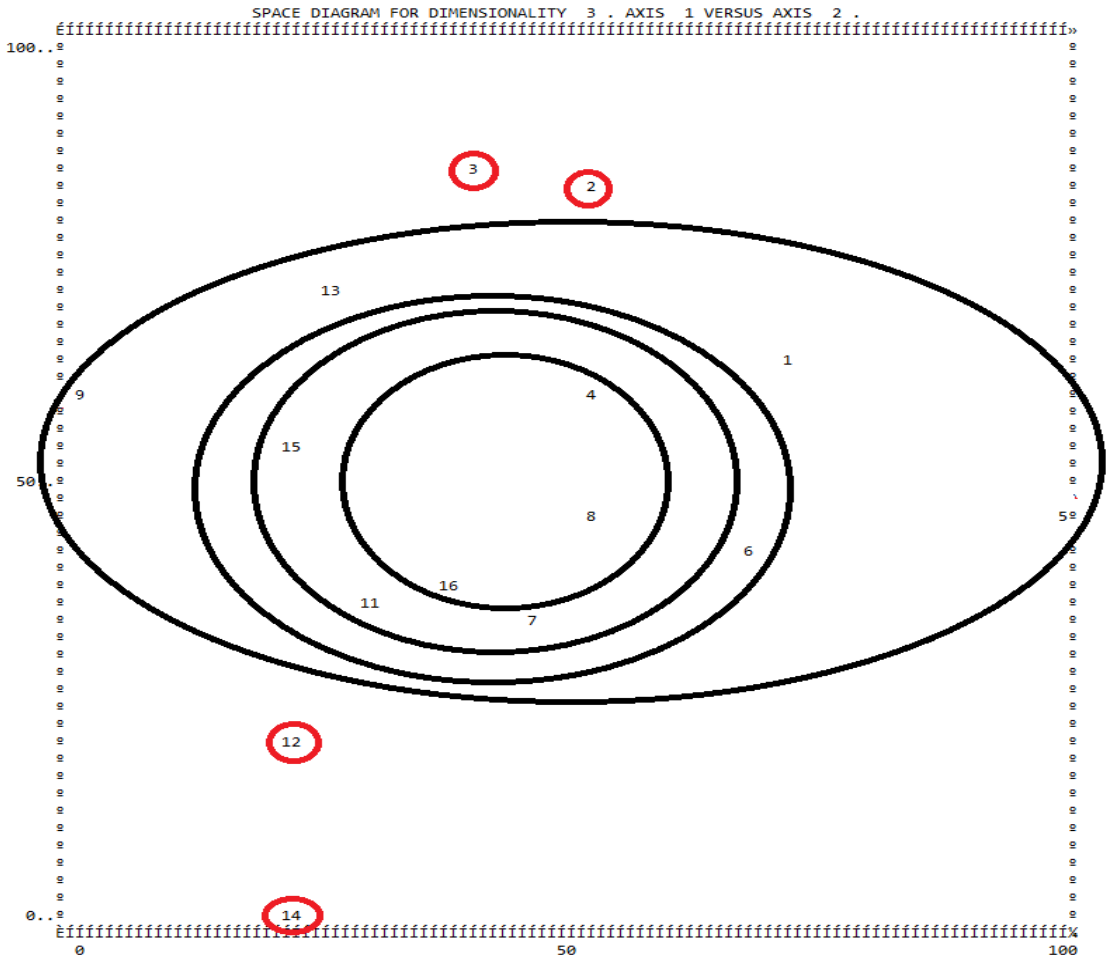

Figure 4: A 2- Dimensional Projection of a 3-Dimensional FSSA Solution Depict a R Radial Partitioning of the Space Based on the Mode Facet

Multiple Scaling by POSAC/LSA

Multiple Scaling is a generalization of the one-dimensional Guttman Scale (Guttman, 1944; Shye, 2008) to higher dimensionalities. Multiple Scaling is elaborated on extensively in Shye (1985). It consists of two steps:

1. Mapping subjects' profiles into the smallest coordinate space that preserves the order relations (incomparability as well as comparability) among them;
2. Interpreting the coordinates as fundamental measurement scales of the investigated content universe (here, SQOL values).

POSAC/LSA (Partial Order Scalogram Analysis by Coordinates with Lattice Space Analysis) is the program that implements Multiple Scaling (Shye & Amar, 1985).

For a multiple scaling of the 16 value items in our questionnaire, I dichotomized all items based on the midpoint 3 on the Likert scale; if the item was rated above 3, it was assigned the score 1, otherwise it was assigned the score 0.
39 different profiles were found and mapped by POSAC (see figure 5). The proportion of profile-pairs correctly represented is 74.11%. We can use the deviations table as well as LSA2 and subsystem diagrams to infer the subsystems roles. (see figure 7 for the deviation table; figure 8 for LSA2).

ITEM	POLAR		ACC/ATT		PROMO		MODIF	
1	292.11	X	121.05	T	81.58	X	36.84	T
2	273.68	X	142.11	T	115.79	Y	68.42	T
3	400.00	X	131.58	T	107.89	Y	78.95	T
4	323.68	X	131.58	T	100.00	X	81.58	T
5	305.26	X	136.84	C	105.26	Y	73.68	C
6	339.47	X	94.74	T	86.84	X	36.84	T
7	250.00	X	110.53	T	73.68	Y	63.16	T
8	121.05	X	71.05	T	47.37	X	21.05	T
9	5.26	Y	5.26	C	2.63	Y	2.63	T
10	321.05	Y	55.26	T	55.26	Y	39.47	T
11	342.11	X	178.95	T	123.68	X	107.89	C
12	321.05	X	155.26	T	89.47	Y	68.42	C
13	228.95	X	142.11	C	78.95	X	60.53	C
14	302.63	X	168.42	T	97.37	Y	50.00	C
15	60.53	X	50.00	T	10.53	X	10.53	C
16	207.89	X	152.63	T	89.47	X	78.95	C

Figure 5: Deviation Table (A POSAC Output)

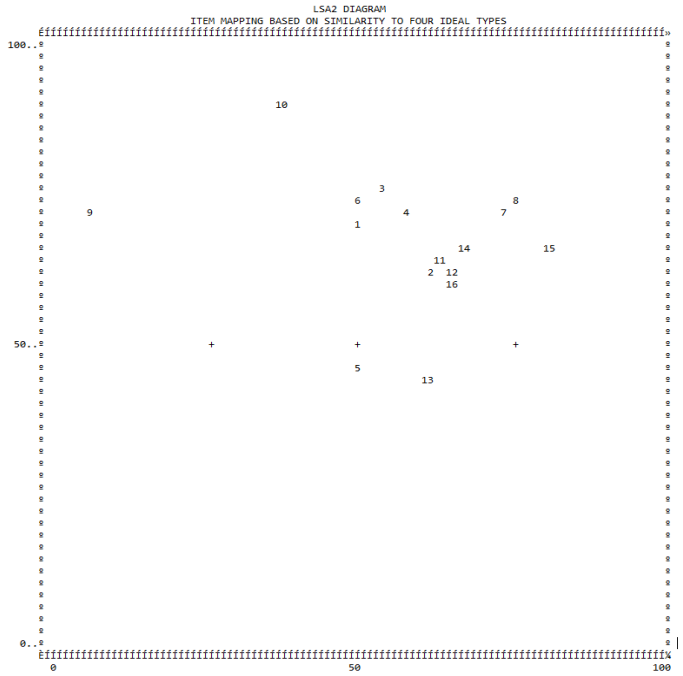

Figure 6. Lattice Space Analysis 2 (LSA2): A mapping of the Variables According to the Shape of their Partition Lines (A POSAC/LSA output)

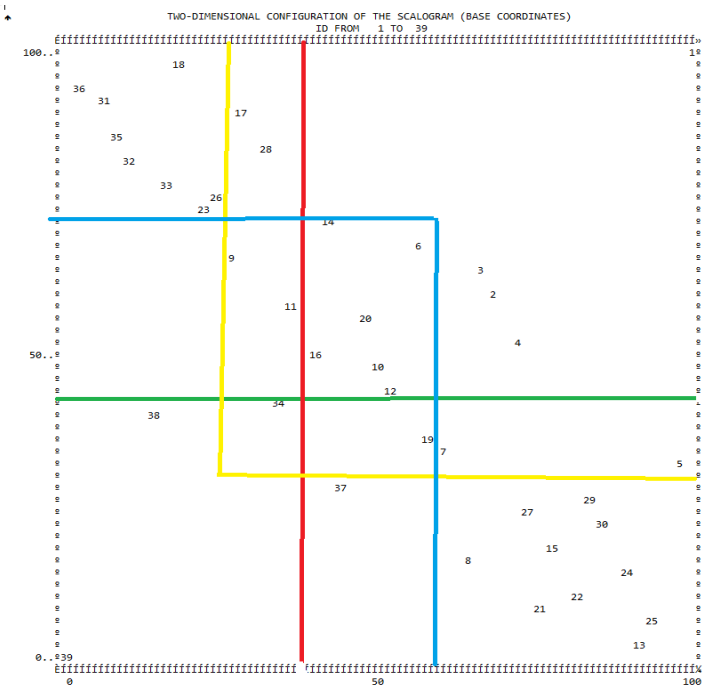

Figure 7: POSAC Map of Observed Profiles with Items Partitioned Lines

The social expressive mode (Figure 7: Item 9 partition-line is horizontal, in green) endows its content to the Y axis and separates profiles into those high or low in the importance of having social influence on other people. The cultural integrative mode (Item 15 partition line, vertical, in red) endows its content to the X axis and separates profiles into those high or low in the importance of consistency in cultural values. The social adaptive mode (item 10, L-shaped line, in yellow) works as an attenuator: Whoever is low in either the X axis or the Y axis will be in the higher part of this "low interval" if they are also high in the social adaptive mode i.e. in the importance given to the ability to relate to social institutions, or they will be in the lower part of this "low interval" if they are also low in the social adaptive mode. The physical expressive mode and the cultural expressive mode can potentially serve as inverted L-shaped accentuators; however a closer look at their diagrams show that cultural expressive accentuator (Item 13, inverted L-Shaped, in blue) is more informative than the physical expressive accentuator (Item 5), considering that most of the participants scored 0 in item 5. The cultural expressive mode (Item 13, inverted L-shaped, in blue) is an accentuator; whoever is high in the X or Y axes will be even higher in them if they are also high the cultural expressive mode and hold high importance to the expression of values (see Figure 7). These observations prepare the way for interpreting the X and Y coordinates as fundamental scales for universal values. See Discussion below.

DISCUSSION

Quality of life (QOL) is a multidimensional construct that, despite its high importance for nearly everyone, has been elusive for definition. Shye's (1989) Systemic Quality of life Model (SQOL) has been validated and used in several papers in the literature. Shye subsequently based a novel universal values model on the SQOL, where he takes the same items in the SQOL questionnaire and asks about their importance as values rather than their presence in the participants life. This

SQOL values model was tested and validated in an Israeli sample. Furthermore, it is assumed to be universal and free of cultural bias.

The present research utilizes this novel QOL-based values model in an Israeli Arab sample of 43 participants to test the hypothesis that the FSSA space partitioning of the QOL values universe will follow the results found in the literature. Indeed, we found that all signs of the coefficient matrix (except for one) are positive, that in the two-dimensional FSSA, the personality subsystem is opposite the cultural, and the social subsystem is opposite the physical, and they all play an angular role, forming a circumplex, and that in the three-dimensional FSSA, our hypothesis that the functioning mode facet will display a radial role is largely supported.

Looking at the POSAC scalogram in the Arab-Israeli sample, the social expressive value endows its content on the Y axis and the integrative cultural value on the X axis. The social adaptive value works as an L-shaped attenuator and the cultural expressive value works as an inverted L-shaped accentuator. This is different from the results that Shye received for the Jewish Israeli sample, where the expressive personality value endows its content on the Y axis, the conservative cultural value on the X axis, the social integrative value works as an L-shaped attenuator and the physical expressive value works as an inverted L-shaped accentuator.

In the Israeli-Jewish sample, it appears that meaning of the coordinate-scales, X and Y, is dominated by cultural belonging and self-actualization. Moreover, physical control accentuates both. It appears that in the Israeli-Jewish sample, considering cultural belonging as extremely important, is accentuated if accompanied by valuing physical control of environment, possibly indicating a tendency to impose uniform cultural patterns. Similarly, the importance of personal expression, too, is accentuated the more importance the individual places on physical control. This can reflect the importance of physical forms of personality expression such as sports, dancing, yoga etc. Moreover, the social integrative value i.e., close relationships, plays an attenuating role: If an individual is low in the importance of cultural belonging or in the importance of self-actualization, they are in the higher part of this "low section" (a bit less low) if they hold close relationships in high importance and in the lower part of it if not. This can reflect how mutual relations with other people affect the individual; if the individual holds their relations with others as important, this increases the value of belonging to the common culture. On the other hand, close relationships contribute to personal growth of the individual, even if the individual is low in the value of self-actualization. *The two scales in the Jewish-Israeli sample are, therefore, a generalized notion of Cultural belonging; and a generalized notion of self-actualization.*

The Israeli-Arab sample, in contrast, the meaning of the Y coordinate is determined primarily by the 'social influence' value. This can reflect the more collective context that Israeli-Arabs live in where social influence is a more prominent construct than personal influence. In the Israeli Arab sample, the balance among inner cultural values endows its content to the X axis. This may reflect the fact that such a balance is a major concern for them as a minority living amongst a majority with different cultural values. The cultural expressive works as an accentuator. Those who highly value social influence or their inner balance of values, will be even higher on each of these, if they also hold high value for cultural expression. The social adaptive value, or 'good communication with institutions' works as an attenuator in the Arab Israeli sample. An Individual that is low in the importance of social influence or inner values balance, will be even lower if they don't value

managing well with formal institutions, and will be on the higher end of the low interval if they do care about managing well with formal institutions. *The two scales in the Israeli-Arab sample are, therefore, a generalized notion of Social influence; and a generalized notion of integrating among personal values.*

Looking at the descriptive statistics, it appears that our sample holds the most importance for achieving personal ambitions, for comfortable life conditions and for security from bodily harms. The number of Arab students in Israeli universities grew 78% in 7 years, (Times of Israel). This can reflect the importance of self-actualization which we see in our data. In 2016, 53% of Arab families lived in poverty (after taxes and transfer payments), compared with 14% of Jewish families (the Myers-JDC-Brookdale Institute). This stark contrast can potentially explain why the Israeli-Arab sample puts a particular emphasis on comfortable life conditions. In 2019, a record 93 people were murdered in Israel's Palestinian Arab community (972magazine). Organized crime and gun violence have been terrorizing the Arab community for decades and 70% of the cases go unsolved. This could explain why our sample holds high importance for safety from bodily harms. One limitation of this study is the small sample size and its high homogeneity which limits its external validity. It is not clear to what extent our results generalize to Arab men and to Israeli-Arabs that are from other towns and villages. Moreover, this study was conducted during the COVID19 pandemic and particularly during a time where it has hit the Arab towns and villages severely, both financially and physically. It is not clear whether these results generalize under normal circumstances.

This study is a promising preliminary work in the research on universal values in the Arab minority in Israel. Future research can replicate this study, compare Jewish and Arab samples, extend the heterogeneity of the Arab sample, and test new hypotheses about the relations that these universal values play with different life factors, such as success or education.

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Appendix 1: Correlation Coefficients Matrix

INPUT MATRIX*

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
v1	1	100	76	51	67	51	83	63	85	45	49	48	36	60	8	51	56
v2	2	76	100	81	76	53	52	51	71	36	67	68	7	57	6	71	38
v3	3	51	81	100	82	37	56	59	55	49	70	52	-2	50	23	59	15
v4	4	67	76	82	100	65	82	87	86	55	79	65	25	57	45	62	23
v5	5	51	53	37	65	100	65	47	47	21	25	48	10	2	9	40	34
v6	6	83	52	56	82	65	100	88	86	64	60	59	49	46	40	36	34
v7	7	63	51	59	87	47	88	100	96	52	80	76	56	46	65	52	31
v8	8	85	71	55	86	47	86	96	100	51	76	82	63	54	50	68	52
v9	9	45	36	49	55	21	64	52	51	100	87	46	55	62	35	69	25
v10	10	49	67	70	79	25	60	80	76	87	100	86	50	57	55	82	42
v11	11	48	68	52	65	48	59	76	82	46	86	100	69	58	52	80	42
v12	12	36	7	-2	25	10	49	56	63	55	50	69	100	63	79	74	84
v13	13	60	57	50	57	2	46	46	54	62	57	58	63	100	31	80	70
v14	14	8	6	23	45	9	40	65	50	35	55	52	79	31	100	59	57
v15	15	51	71	59	62	40	36	52	68	69	82	80	74	80	59	100	76
v16	16	56	38	15	23	34	34	31	52	25	42	42	84	70	57	76	100

* THE ORIGINAL COEFFICIENTS WERE MULTIPLIED BY 100 AND ROUNDED INTO INTEGER NUMBERS

DECISION MAKING UNDER RISK: MULTIPLE SCALING OF GAMBLING BEHAVIOR

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ABSTRACT

In previous works (Shye & Haber 2015; 2020) we presented a cognitive model for choice under risk. We demonstrated that a newly devised *challenge index* (CI) attributable to every binary choice (gain or loss) problem predicts the popularity of the bold option, the one of lower probability to gain a higher monetary outcome (in a gain problem); and the one of higher probability to lose a lower monetary outcome (in a loss problem). In this paper we use POSAC/LSA program to create and interpret the two measurement scales necessary and sufficient for assessing people's risky choice behavior. The data consist of responses obtained from 126 student, specifying their preferences in 44 risky decision problems, 22 gain problems and 22 loss problems. A Faceted SSA of the 44 problems confirmed the hypothesis that the space of binary risky choice problems is partitionable by two binary axial facets: (a) Type of Problem (gain vs. loss); and (b) CI (Low vs. High). Next, four *composite variables* (Shye, 2009; Haber, 2015) were created, representing respectively the combined scores in each of four subsets of choice-problems corresponding to the four facet-elements obtainable from the two facets: Gain, Loss, High-CI and Low-CI. The four composite variables were processed by POSAC/LSA, revealing that boldness in gain-problems and boldness in loss-problems play respectively Y- and X- polar roles; that boldness in low-CI problems plays an attenuating role; and that boldness in high-CI problems plays an accentuating role. These findings lead to a meaningful and intuitively appealing interpretation of the POSAC axes, yielding two four-interval gambling-behavior measurement scales.

1. INTRODUCTION

The Challenge Theory (CT) for decision under risk is a dual system stochastic model for binary choice behavior, based on the assumption that in decision under risk, two cognitive processing systems, the *automatic system* and the *analytic system* operate sequentially (Shye & Haber 2015; 2020). The automatic system reacts rapidly, providing the initial, *default* response which according to CT is based on the probabilities alone (initially disregarding the amounts of gain or of losses). Hence the default choice would be preference for the option to gain a smaller amount with a higher probability (in gains problems); and preference for the option to incur a higher loss with a lower probability (in loss problems). Then the analytic system enters into play examining the magnitude of the challenge involved in abandoning the default option and risking the alternative, the *bold*, option. The Challenge Index (CI) for every binary (monetary) choice problem was argued to be computable for both, gain and loss problems, thus:

$$CI[(x_0, p_0), (x_1, p_1)] = \frac{f_0|x_0|}{f_1|x_1|}\left(w_0(p_0) - w_1(p_1)\right)$$

where for gain problems, in gamble $[(x_0, p_0), (x_1, p_1)]$ (with $x_1 > x_0 > 0$ and $0 < p_1 < p_0$), option (x_0, p_0) is the default option and (x_1, p_1) is the bold option. And where for loss problems, in gamble $[(x_0, p_0), (x_1, p_1)]$, (with $x_1 < x_0 < 0$ and $0 < p_1 < p_0$), option (x_1, p_1) is the default option and (x_0, p_0) is the bold option. And where f_0, f_1, w_0, w_1 are non-decreasing functions of their respective arguments, and w_0, w_1 are such that $w_0(p_0) - w_1(p_1) > 0$.

In Section 2 below, the structure of the Gambling-Behavior space is examined, validating a set of gambling-behavior theoretical constructs. In Section 3, composite variables representing these constructs are created. These composite variables, taken to represent basic parameters of gambling behavior, are processed by Partial Order Scalogram Analysis (POSAC/LSA) to produce two scales that are necessary and sufficient for assessing gambling behavior.

2. THE GAMBLING BEHAVIOR SPACE: FACETED SSA

2.1 Data

The data of this study consist of responses obtained from 126 student, specifying their preferences in 44 risky decision problems, 22 gain problems and 22 loss problems. The universe of observations is presented by the following mapping sentence:

A Mapping Sentence for Risky Choice Behavior

The extent to which testee (x), faced with a binary risky $\begin{Bmatrix} \boldsymbol{Gain} \\ \boldsymbol{Loss} \end{Bmatrix}$ **-type**

problem of $\begin{Bmatrix} \boldsymbol{High} \\ \boldsymbol{Low} \end{Bmatrix}$ **level** of challenge index (CI), demonstrates bold

gambling behavior $\rightarrow \begin{Bmatrix} High\ (chooses\ bold\ option) \\ Low\ (chooses\ default\ option) \end{Bmatrix}$

where *bold gambling behavior* is defined, for gain problems, as choosing the option of lower probability to make a higher gain (rather than the alternative option of higher probability to make a lower gain); and is defined for loss problems as choosing the option of higher probability to incur a lower loss (rather than the alternative option of lower probability to incur a higher loss). Note that variables defined in the mapping sentence all have a Common Meaning Range (CMR), namely that of *boldness*: The choice of the bold option indicates a gambling behavior that is high on boldness, and the choice of the default option indicates a gambling behavior that is low on boldness.

2.2 Testing the Regional Hypotheses: The Structure of (Bold) Gambling Behavior

A two-dimensional Faceted SSA of the 44 problems (with the coefficient of weak monotonicity between reported boldness scores as similarity measure between problem-pairs) was performed using FSSAWIN (Figure 1).

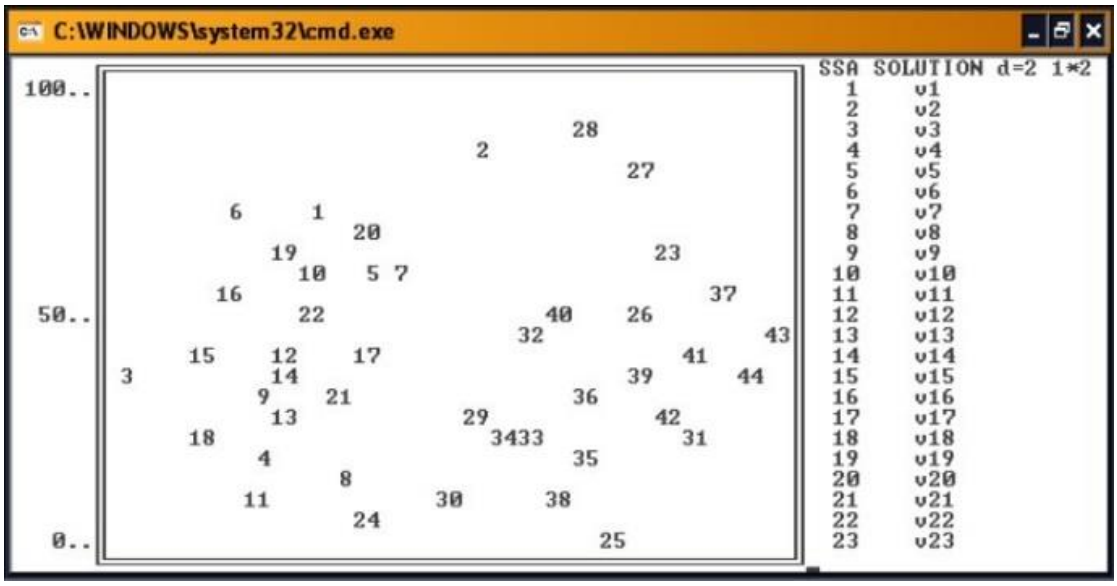
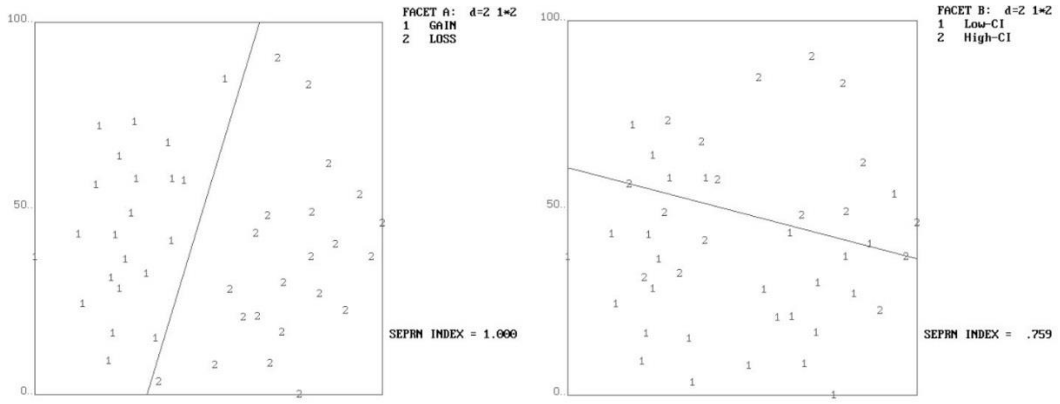


Figure 1. Bold Gambling Behavior Space
Smallest Space Analysis of 44 Gambling Problems
SSA Screen Diagram Produced by FSSAWIN Program

Next, the regional hypotheses suggested by the problem-**type** and the problem-CI-**level** facets, were tested by Faceted SSA (FSSAWIN), a computerized partitioning procedure Shye (1991a, 1991b. See also Borg & Shye, 1995). Results confirm the two hypotheses: the problem-type facet is fully validated (Separation Index, SI=1.00); and the CI-level facet is well supported (SI=0.76). See Figure 2.



Facet A: {Gain, Loss} Problem **Facet B: {Low, High} Challenge Index (CI)**

Figure 2. Bold Gambling Behavior Space
Partitions by Facet A: {Gain, Loss} Problem and by Facet B: {High, Low} CI
Partitioned Item Screen Diagrams Produced by FSSAWIN Program

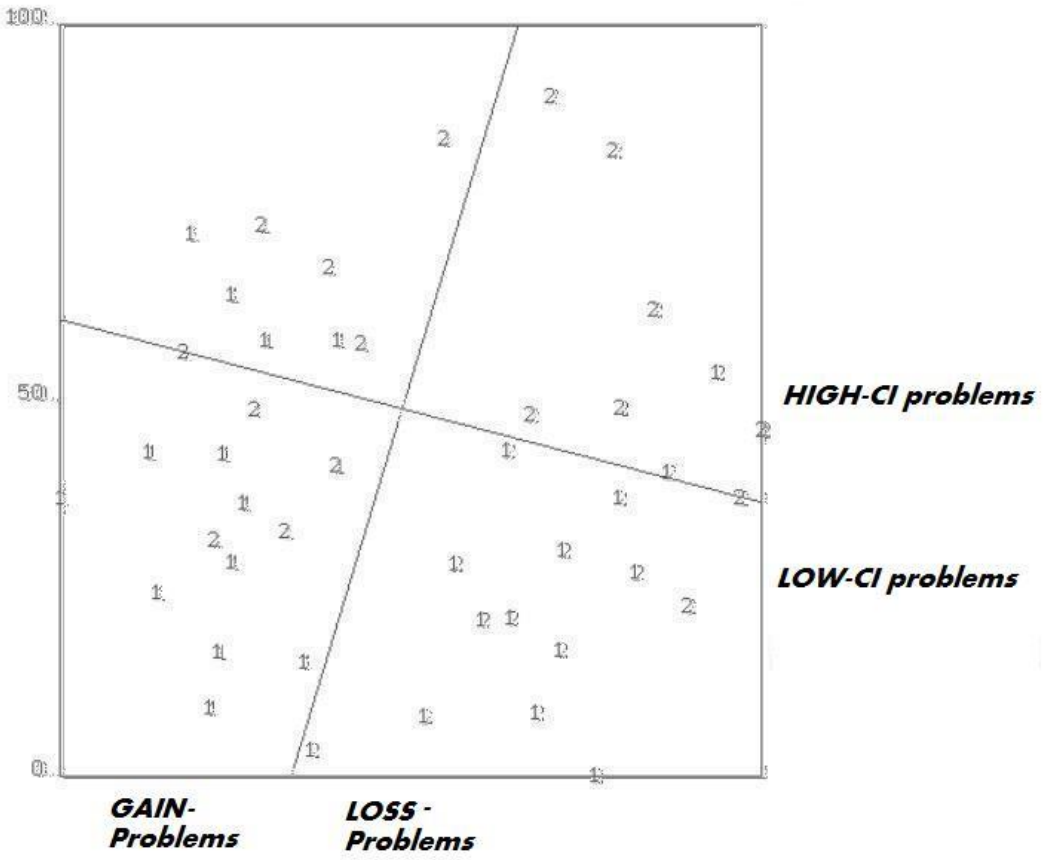


Figure 3. The Structure of Bold Gambling Behavior Space
Partitions by both Facets, A: {Gain, Loss} and B: {High, Low} CI
Superposition of the two Partitioned Item Diagrams

3. MULTIPLE SCALING BY POSAC OF GAMBLING BEHAVIOR

3.1 Constructs of gambling behavior

The purpose of Multiple Scaling is better served if the variables analyzed by POSAC/LSA have been validated as representing theoretical constructs. Four theoretical constructs have been satisfactorily validated above by Faceted SSA. These constructs are:

Preference of Bold Option in Gain Problems (left-hand side in the map of the gambling behavior space; see Figure 4);
Preference of Bold Option in Loss Problems, (right-hand side in the map of the gambling behavior space; see Figure 4);
Preference of Bold Option in Low-CI Problems (top of the map of the gambling behavior space; see Figure 5).
Preference of Bold Option in High-CI Problems, (top of the map of the gambling behavior space; see Figure 5);

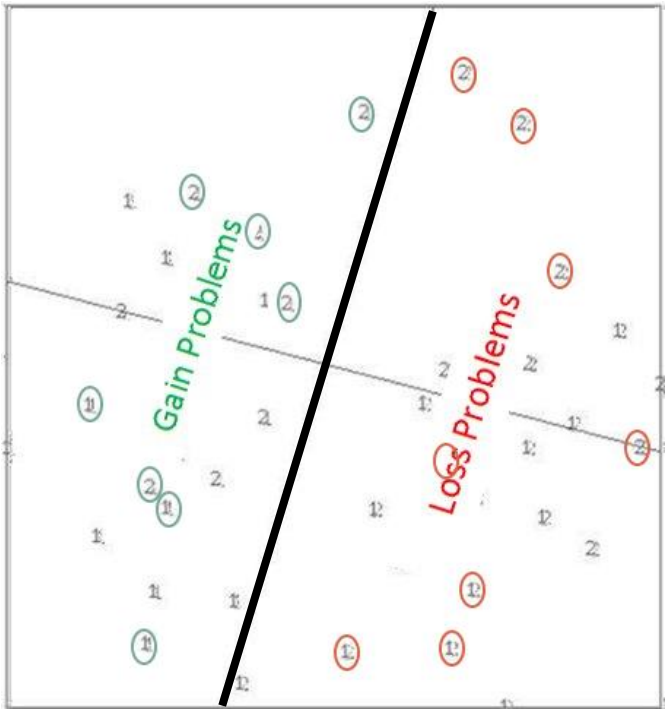


Figure 4. Location in Bold Gambling Behavior Space of Variables Selected to Represent Gain Problem Region and Loss Problem Region

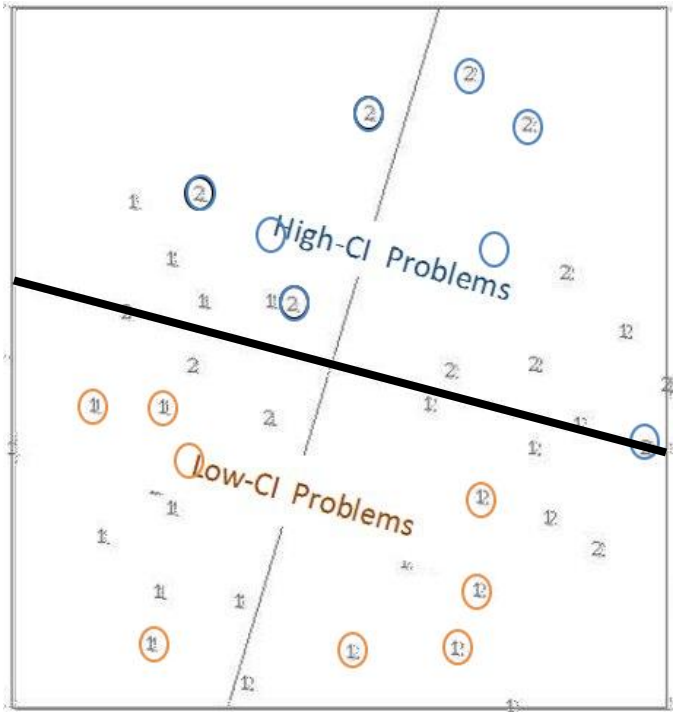


Figure 5. Location in Bold Gambling Behavior Space of Variables Selected to Represent High-CI Problem Region and Low-CI Problem Region

For each of these four constructs, taken to constitute a basic notion of gambling behavior, several representative variables were selected thus: Inspecting the region in the Bold Gambling-Behavior Space corresponding to the construct in question, those variables were identified which definitionally belong to that region; that is, variables that are not deviants. From among these variables, a set of variables was selected that was well spread within that region. The variables selected to represent a given construct were summed and dichotomized to form a *composite variable* for that construct, with 2 representing a bold choice and 1 representing a cautious (not-bold) choice, in each of the composite variables. Thus, four composite variables were created for respondents in the sample:

Gain Composite Variable. Representing the notion of *bold choice in gain problem*s;
Loss Composite Variable. Representing the notion of *bold choice in loss problems*;
Lo-CI Composite Variable. Representing the notion of *bold choice in low CI problems*.
Hi-CI Composite Variable. Representing the notion of *bold choice in high CI problems*;

3.2 Multiple scaling by POSAC

Every respondent in our sample now receives a profile of four dichotomous scores that represent his or her gambling behavior in terms of the validated constructs. These four-variable profiles, in turn, were processed by POSAC/LSA in order to discover whether a more parsimonious scaling may assess gambling behavior. POSAC map of the 12 empirically obtained profiles, shown in Figure 6, displays a satisfactory partial-order representation of the 4-variable profiles in a 2-coordinate space (CorRep= 0.97).

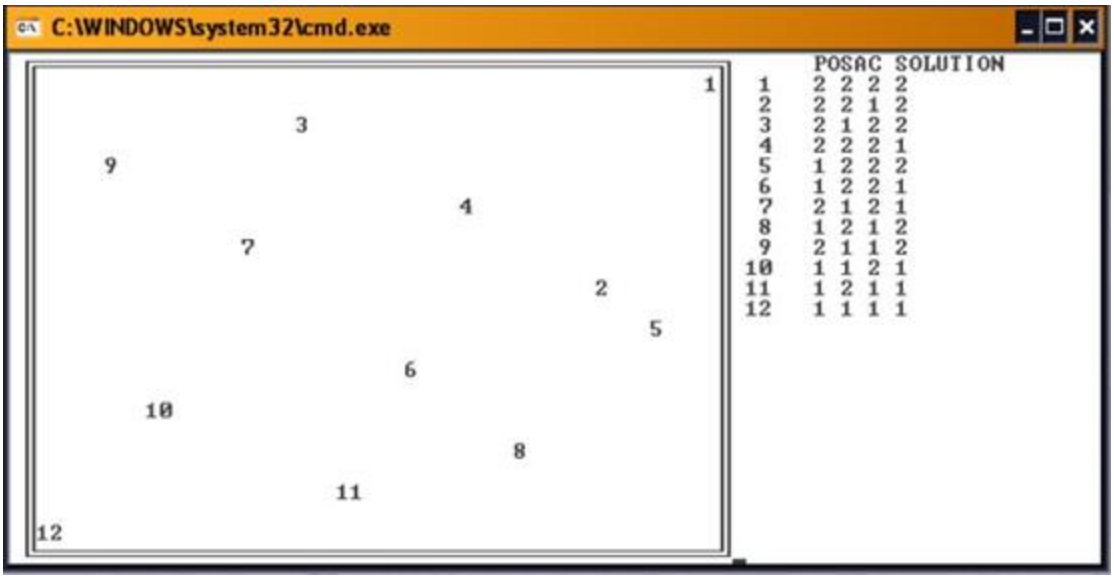


Figure 6. POSAC Solution of the 4-Composite Variables Data Screen Diagram Produced by POSAC/LSA Computer Program

Thus, the two coordinates constitute two scales whose scores are sufficient for reproducing the profiles for every subject in our sample. (Evidently, they are also necessary, since a single scale – a Guttman scale – will not do.) The scaling operation, however, requires also the *interpretation* of

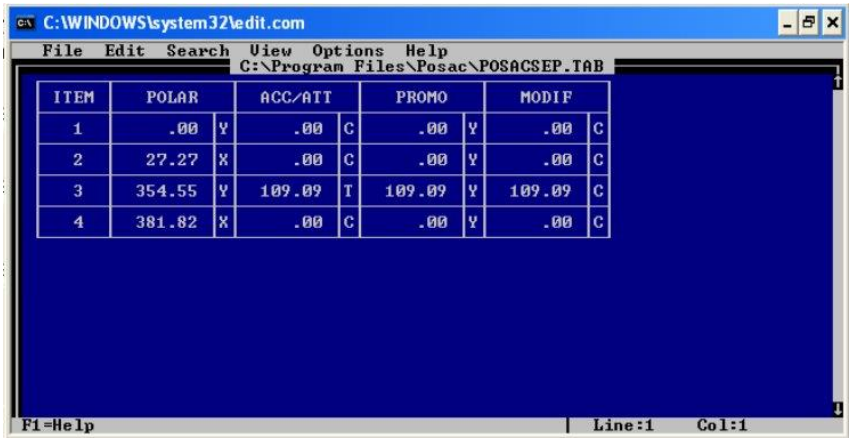
the two coordinate scales. That is, to reveal the substantive meaning of these two fundamental variables. This is achieved by investigating the *item diagrams* that POSAC produces. An item diagram, or a diagram of a given item (a variables processed) is a reproduction of the POSAC map, where, each profile-ID is replaced by the value of the item in that profile. For dichotomous items, partition lines are then sought that separate the profiles that are high (=2) in that item (above and to the right of the partition line) from those that are low (=1) in it (below and to the left of the partition line). It has been mathematically proven (Shye, 1976; 1985) that in two-dimensional POSAC the shape of those partition lines must be that of a decreasing (or non-increasing) step-curve; and that that there are exactly two items (variables) the shapes of whose partition lines are straight lines – one variable having a vertical partition line and the other having a horizontal partition line.

POSAC/LSA computer program finds for each item (POSAC-processed variable) the best fitting partition lines of four shapes: the best straight partition line (no bends); the best partition line with one bend (one right-angle step); the best partition line with two bends (two steps); and the best partition line with three bends (three steps). Each of these solutions is accompanied by a measure of goodness of fit; or, more exactly, by the total deviations produced by profiles it leaves as misfits (taking into account the frequencies of those profiles).

An item whose partition line is a straight line, is said to be a *polar* item (or to play *polar role*). A polar item may be X-polar, if its partition-line crosses the X-axis (i.e., if it is vertical); or it may be Y-polar, if its partition-line crosses the Y-axis (i.e., if it is horizontal);

An item whose partition line has one bend, is said to be an *attenuating* item if its partition line is L-shaped; and it is said to be an *accentuating* item if its partition-line is inverted L shaped. Further roles assigned to items with two or more bends. (See Shye, 1976; 1985)

A table produced by the program summarizes, for every item (variable), the sum total deviations for each of the four model partition lines. This information facilitates the determination of the optimal assignment of *roles* to the items. The deviations table obtained in the present study is shown in Figure 7.



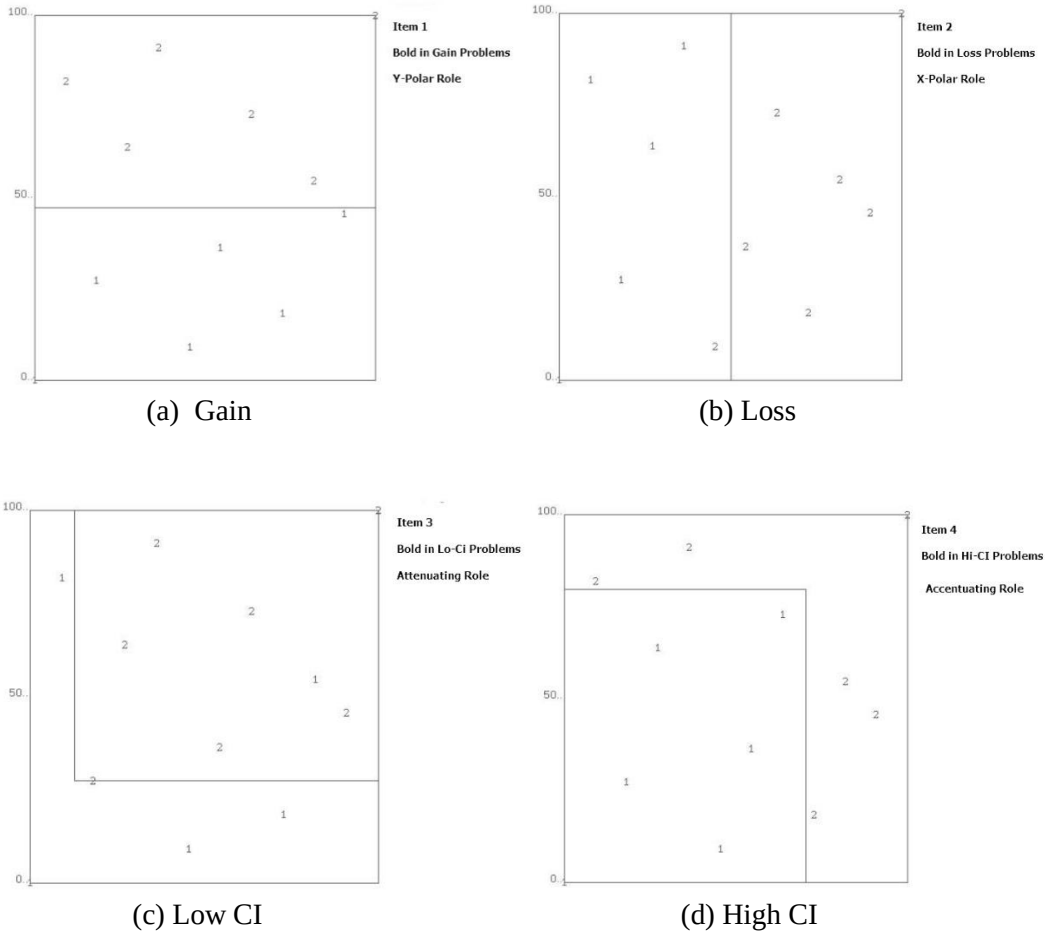
ITEM	POLAR		ACC/ATT		PROMO		MODIF	
1	.00	Y	.00	C	.00	Y	.00	C
2	27.27	X	.00	C	.00	Y	.00	C
3	354.55	Y	109.09	T	109.09	Y	109.09	C
4	381.82	X	.00	C	.00	Y	.00	C

Figure 7. Deviations Table Produced by POSAC/LSA is Consulted to Determine the Optimal Role of Variables (Items) Processed by the Program

Inspecting the table, we first identify the two polar items, those that have the minimum deviations from the model partition line. The choice in this case is simple: Item 1, representing the notion of "boldness in gain problems" is a Y-Polar item with 0 deviations from a (horizontal) straight line. Item 2, representing the notion of "boldness in loss problems", with its relatively small deviations for the polar is assigned the X-Polar role. (True, as an accentuating item it would fit perfectly, with deviations. But recall that there must be two polar items, and no other item would fit better as a polar item).

Next, we turn to examine the role played by Item 3, which represents the notion of "boldness in Low-CI problems". It cannot play a polar role because the best polar items have been identified; and there can be no more than these two. Examining this item's fit as an accentuating/attenuating item (having a 1-bend partition line) we find that, indeed, by allowing a bend in its partition line, deviations decrease considerably from 354 to 109. Moreover, allowing further bends (2 or 3, corresponding to a *promoting role* or a *modifying role*) does not serve to reduce deviations. Hence the optimal role for Item 3 is attenuating role. (The T in the 5^{th} column indicates *this, attenuating* role, rather than the alternative accentuating role, which is also associated with a 1-bend partition line.) Finally, Item 4, representing the notion of "Boldness in High-CI problems" clearly plays an accentuation with 0 deviations. (That it is an accentuating rather than an attenuating item, is indicated by the C in the 5^{th} column of the table.)

For the present data, POSAC/LSA program produced 16 partitioned item diagrams (four partition-models for each of the four items). Here we reproduce only the four item diagrams identified above as optimal, one for each of the four items. These are the diagrams that will enables us to deduce the Gambling Behavior Measurement Space. See Figure 8 (a)-(d).



(a) Gain (b) Loss

(c) Low CI (d) High CI

Figure 8. Optimal Partitioned Diagrams for the Four Items (Composite Variables: Boldness in Gain, Loss, High-CI, Low CI Problems)

A superposition of the four item diagrams of Figure 8, constitutes the measurement space for gambling behavior. The two coordinates, X, Y, of this space are the two optimal – necessary and sufficient -- measurement scales for this behavior. Indeed, every profile-point in the POSAC space (based on the FSSA-validated constructs), is uniquely transformed into 2 scores, (x, y). The coordinate values (x, y) therefore reproduce the observed composite variables.

3.3 Interpreting the coordinate-scales

However, to complete this multiple-scaling procedure, the coordinate-scales must be interpreted; that is, their substantive contents must be determined. Being the fewest number of scales for the content universe studied, they are taken to constitute the fundamental variables of observed reality, the variables that determine all empirically observed phenomena.

Using products of POSAC/LSA program, the interpretation of the scales is done by a piecemeal content-analysis of each of their intervals. Thus, the intervals in each coordinate must first be identified.

The interpretation procedure starts by noting the two polar variables, Gain and Loss. Starting, say, with the Gain Composite Variable, we find that low values in the Y-coordinate, those below the horizontal partition line, are associated with cautious gambling behavior (i.e., a relative tendency to prefer default options) in gain problems; while high values in the Y-coordinate, those above the horizontal partition line, are associated with bold choices (i.e., a tendency to prefer bold options) in gain problems. Similarly, the X-coordinate differentiates between cautious and bold gambling behavior in loss problems. The two polar variables enable a preliminary, rather gross, measurement of gambling behavior. See Figure 9. This 2-dimensional measurement space underscores the need for two rather than one scale: gambling behavior in loss problems differs in an essential way from that of gain problems. A unified, Guttman scale based on the notion of boldness alone will not do.

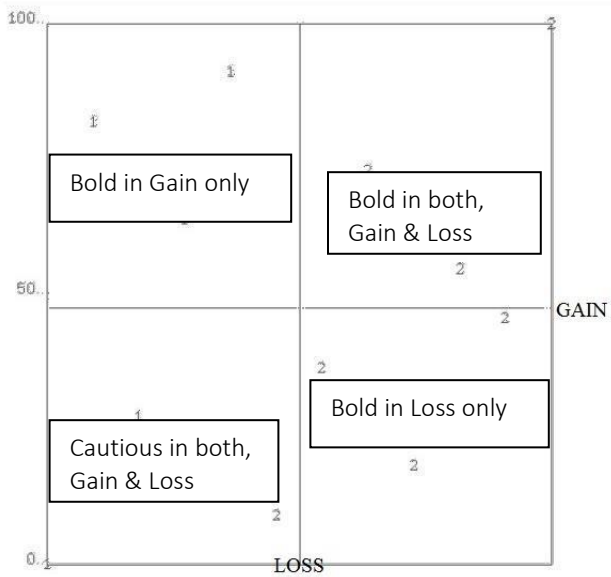


Figure 9. Partitioning the Measurement Space by the Two Polar Items is the First Step in Interpreting the Gambling-Behavior Coordinate-Scales

Next, we further partition the measurement space by the (L-shaped) partition line of Low-CI, and by the (Inverted-L-shaped) Partition line of High-CI, to obtain Figure 10. And we note that the bend in the L-shaped partition line of Low-CI problems marks a point on the X-Coordinate and a point on the Y-Coordinate (see dotted lines). The result is a division of the X-Coordinate into four intervals (marked ***1,2,3,4***) and similarly, a division of the Y-Coordinate into four intervals (marked ***1,2,3,4***).

Drawing on the content-definitions of the four items that partition the space, we now interpret each of the two coordinates as scales of gambling behavior. The interpretation is essentially a semantic compound of the logical significance of the four intervals that make up the coordinate-scale.

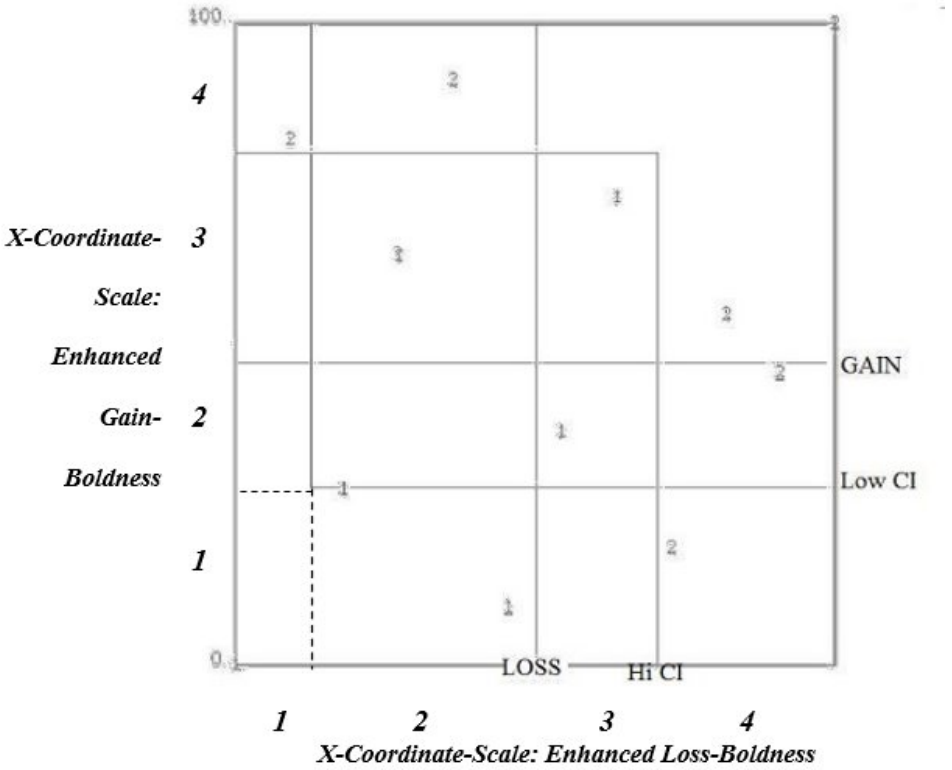


Figure 10. Superposition of the Four Partitioned Diagrams of Figure 9 Determine Four Meaningful Intervals on the X-Coordinate Scale and Four Intervals on the Y-Coordinate-Scale

3.3.1 Interpreting the X-Coordinate-Scale

Intervals ***1*** and ***2*** represent cautious behavior in loss problems; for they characterize profiles that are to the left of (below) the vertical partition line of the "boldness in loss problems" construct. However, interval ***1*** represents, in addition, cautious behavior in Low-CI problems, while interval ***2*** represents bold behavior in Low-CI problems, thus alleviating the cautious behavior in loss problems (but not so much as to cross the threshold marked by the loss partition line). People (profiles) scoring ***2*** on the X-coordinate-scale are therefore bolder in loss problems than people with score ***1*** in that scale.

Intervals ***3*** and ***4*** represent bold behavior in gain problems; for they characterize profiles that are to the right (above) the vertical partition line of the "boldness in loss problems" construct. However, interval ***3*** represents, in addition, cautious behavior in High-CI problems, while interval ***4*** represents bold behavior in High-CI problems, thus strengthening the bold behavior in loss problems. People (profiles) scoring ***4*** on the X-coordinate-scale are therefore bolder in loss problems than people with score ***3*** in that scale.

We conclude that the X-coordinate-scale, with its four meaningful intervals, embodies a new concept of *enhanced loss-boldness-behavior*. This is an underlying fundamental variable that, together with Y-coordinate scale, enables preservation of observed order relations, including incomparability, among observed profiles.

3.3.2 Interpreting the Y-Coordinate-Scale

The interpretation of the Y-Coordinate-Scale follows the same logical steps as that of the X-Coordinate-Scale:

Intervals ***1*** and ***2*** represent cautious behavior in gain problems; for they characterize profiles that are below the horizontal partition line of the "boldness in gain problems" construct. However, interval ***1*** represents, in addition, cautious behavior in Low-CI problems, while interval ***2*** represents bold behavior in Low-CI problems, thus alleviating the cautious behavior in gain problems (but not so much as to cross the threshold marked by the gain partition line). People (profiles) scoring ***2*** on the Y-coordinate-scale are therefore bolder in gain problems than people with score ***1*** on that scale.

Intervals ***3*** and ***4*** represent bold behavior in gain problems; for they characterize profiles that are above the horizontal partition line of the "boldness in gain problems" construct. However, interval ***3*** represents, in addition, cautious behavior in High-CI problems, while interval ***4*** represents bold behavior in High-CI problems, thus strengthening the bold behavior in gain problems. People (profiles) scoring ***4*** on the Y-coordinate-scale are therefore bolder in gain problems than people with score ***3*** in that scale.

We conclude that the Y-coordinate-scale, with its four meaningful intervals, embodies a new concept of *enhanced gain-boldness-behavior*. This is another underlying fundamental variable that, together with X-coordinate scale, enables preservation of observed order relations, including incomparability, among observed profiles.

4. DISCUSSION

Order relations, comparability as well as incomparability, among observed people's profiles constitute the essence of "measurement". The preservation of these relationships in the two-dimensional POSAC space means that a parsimonious gambling behavior measurement technique has been attained; and that the two scales, as fundamental variables, capture the essential factors that determine observed gambling behavior.

In many domains of research and applications, artificial intelligence (AI) procedures have been employed to manipulate and drawing conclusions concerning *numerical* or *pictorial* objects. The procedure described above, of inferring the semantic significance of the two scales, X and Y, may well be considered a novel AI procedure of manipulating and drawing conclusions concerning *semantic* objects.

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THE STRUCTURE AND MEASUREMENT OF CURIOSITY: FACETED SSA AND MULTIPLE SCALING

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ABSTRACT

We utilize tools from the field of Facet Theory to examine data on manifestations of curiosity among people. Forty-one participants were presented with a set of 60 questions, of which 30 concerned trivial, gossip-related and opinion-based topics (and were pre-classified as "urge-invoking") and 30 concerned factual, serious and intellectually-oriented topics (pre-classified as "interest-invoking"). However (regardless of the pre-classifications), each of the 60 questions was presented twice: First, inquiring how much *urge* it raised and second, how much *interest* it raised in the respondent.

The 120 variables of this study were analyzed using a Faceted SSA procedure, testing a Type of Evaluation Facet (urge vs. interest), to assess whether participants can differentiate between the two types as reflected by their aroused curiosity evaluations. Two additional facets were suggested and tested in order to understand and characterize the content structure of curiosity: the questions' *time-reference* (past vs. contemporary) and its *topical orientation* (humanities vs. sciences).

While testing the time-reference and topical-orientation facets on the entire data, using Faceted SSA, did not yield high separation indices for the most part, splitting the data into subsets did reveal insightful results: examining the participants' aroused urge and interest ratings separately, yielded fairly high separation indices, especially for the urge-based ratings, which indicates that a question's time-reference and topical-orientation may relevant to the structure of curiosity. Next, Partial Order Scalogram Analysis by Coordinates (using POSAC/LSA program) yielded two interpretable coordinate-scales for assessing people's curiosity and information-seeking behavior, which revealed that people's affinity towards past and towards contemporary topics was dominant in defining the two scales (i.e., playing polar roles); with sciences and humanities refining the scales by playing the attenuating and an accentuating roles, respectively.

1. INTRODUCTION

Although curiosity plays a major role in our daily pursuits, relatively little is known about its innerworkings and its related cognitive mechanisms. In fact, defining curiosity proves to be a challenge in itself. It has been suggested that curiosity is "an inconsistency or gap" in knowledge (James, 1890, p.430) which arises in animals due to a lack of information (Berlyne, 1960). This idea was later developed into an information gap theory which suggested that curiosity is a gap between what one wants to know, and what one knows in actuality (Loewenstein, 1994). Recent studies build upon these ideas, reframe curiosity as the motivation to obtain reward, in the form of knowledge, and provide evidence that information indeed can function as a reward, guiding learning processes. Namely, it was found that the valence of information affects its reward value, such that people are more likely to wait longer for positive, compared to neutral information (Marvin & Shohamy, 2016).

Given that curiosity may function as a guiding force which affects people's information- seeking behavior in a significant, and possibly rewarding fashion, assessing its dimensionality is an important matter. The concept of dividing curiosity into different factors is not novel and different dimensions and axes were suggested and tested throughout the years. D.E. Berlyne located curiosity on a four-way categorization produced by two dimensions: one spanning perceptual and epistemic curiosity and the other between specific and diversive curiosity (Berlyne, 1954a, p. 180). The validity of the latter dimension (in which specific curiosity referred to the desire for a particular piece of information in the process of solving a puzzle, and diversive curiosity referred to a general seeking of stimulation) was supported by a factor analysis which showed that the two subscales loaded on separate quasi-independent factors (Day, 1971). Another division which has been tested was between state curiosity (how curious one is in a particular moment, given a specific task) and trait curiosity (how curious one generally is). It was found that the two scales can be distinguished by the trait scale having a high test-retest compared to the state scale which varied across situations (Naylor, 1981).

Considering the curiosity dimensions described above, new ones can be suggested, based on the content of curiosity eliciting items, such as questions. In the information age, in which social media plays an integral role in our daily lives, plenty of strategies are being used in the context of content marketing, in an attempt to generate attention and intrigue potential readers to click on certain links or enter domains. Titles such as "A man tries to hug a lion; you won't believe what happens next!" exemplify these trends and are designed to be sensational while providing the readers with mere partial information, in order to arouse their curiosity and entice them to read the rest of the story. This type of advertisement, typically known as "a clickbait" usually consists of hyperlinks, texts or thumbnails, and inspired Ran Hassin and Ohad Dan from the Hebrew University of Jerusalem to conduct an exploratory study which examines different types of curiosity elicited by questions.

It was hypothesized that trivial, gossip-related, opinion-based and highly salient questions will elicit a different type of curiosity among people, compared to factual, more intellectual, serious and profound questions. The researchers referred to the former as "urge questions" as they believed that people have inherent urge to know the answers to these questions, while calling the latter "interest questions" due to the more profound topics which they cover. More specifically, they hypothesized that in the case of "urge-based questions" the basis for aroused curiosity will be an affective feeling of "urge" to know the answer, while a more cognitive feeling of "interest" will account for curiosity to know the answer to "interest-based questions". For this purpose, participants had to rate each question they were given both on how "urge" and how "interest" eliciting it is. It was assumed that participants will rate "urge questions" higher on an "urge" scale compared to "interest" questions, and vice versa[1].

In this exploratory analysis, we relied on an intuition, according to which, some people may be more naturally curious about contemporary or futuristic subjects while others about history and events that have already occurred. Additionally, we suggested the that while some people may be more curious about topics such as art, music and culture, which fall under the umbrella of

[1] We are grateful to Ran Hassin and Ohad Dan for making this data available to us for the present re-analysis.

humanities, some may be more curious about science-oriented disciplines such as biology, geology and physics.

In order to put the suggested time and orientation facets to test and assess whether they may be of relevance to information seeking behavior, Faceted SSA (Smallest Space Analysis) was used on the collected data which consisted of urge and interest evaluations for each question. Each of the two facets contained two levels, as can be seen in the following mapping sentence:

Curiosity aroused in person (x) in response to a question with a {contemporary/past} time-reference, that is {humanities/science} oriented, in which he/she had to submit {urge/interest} evaluations ⟶ {1 to 10 curiosity level}.

Subsequently, based on the structure of curiosity revealed by Faceted SSA regarding the time and orientation facets, curiosity measurement scales were obtained and interpreted using Multiple Scaling by POSAC (Partial Order Scalogram Analysis by Coordinates) program.

2. METHOD

2.1 Participants

A sample of 41 participants completed an online survey on Amazon Mechanical Turk (MTurk) in exchange for a small payment.

2.3 Stimuli

A list of 60 *curiosity-items* that may provoke participants' curiosity, formed the basis for a questionnaire presented to participants[2]. With respect to each curiosity-item, participants were asked to assess (1) how strong an *urge* they felt to know the answer; and (2) how much *interest* they had to know the answer. In fact, then, participants responded to 120 questions.
Examples: "How strong an urge do you feel to know…" and, separately, "to what extent are you interested to know…"
Curiosity-Item 1: "…Who was president when the first U.S. presidential news conference was filmed for TV?"
Curiosity Item 2: "…How much does it cost to launch a person into space?"
Thus, each curiosity-item appeared twice: once, asking participants to evaluate on a scale of 1 to 10 how urge-arousing it is for them, and once, asking them how interest-arousing it is. Questions were presented in a random order.

[2] *Curiosity-items* included both, simple trivia questions and more intellectual-interest questions previously generated by MIT students who were requested to write questions about which they would be interested in reading for about half an hour.

3. THE STRUCTURE OF CURIOSITY: FACETED SMALLEST SPACE ANALYSIS (FSSA)

3.1 Testing Regional Hypotheses on the Entire Dataset

The first FSSA analyses tested the time and orientations facets, as well as the Type of Evaluation Facet, over the entire dataset. Since FSSA program can process no more than 98 variables, 49 out of the 60 curiosity-items were randomly selected, and for each item, both the urge and interest evaluations were taken into account as two separate variables (which makes for 2*49=98 variables, or points, on the FSSA map). This process was repeated three times, each time with a different set of randomly selected curiosity items.

3.1.1 Type (urge/interest) Facet

Three replications yielded satisfactory Separation Indices of .88, .87, .77.

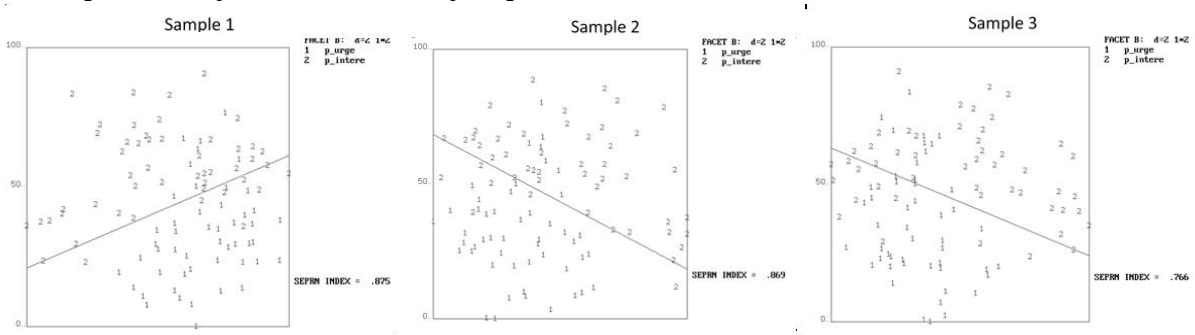


Figure 1. Faceted SSA Validation of the Classification of Items into {urge, interest} Three Replications of the Type Facet Regional Hypothesis Test

Averaging the Separation Indices for the evaluation Type Facet across the three samples, yielded a relatively high value of SI=0.837. This result indicates that participants' patterns of reported values greatly depend on whether they were asked to indicate how much urge or how much interest the questions aroused in them. This result agrees with considerable evidence (e.g., Guttman & Levy, 1982; Shye, 1978) empirically validating the behavior-modality facet having four distinct elements, including the affective modality (with emotional aspect, represented here by the urge-based curiosity), the cognitive modality (with an intellectual aspect, represented here by the interest-based curiosity) in addition to the conative and valuative modalities not represented here.

3.1.2 Time Facet and Orientation Facet

The empirical validity of the Time-Reference Facet (past/contemporary) and of the Topical Orientation Facet (humanities/science-oriented) were tested as well in these data, but were found unsatisfactory: Averaging the separation indices for the time and orientation facets yielded the low values of 0.590 and 0.426 respectively. These results suggest that when testing urge and interest evaluations together, the time and orientation facets do not sharply separate the content space of curiosity. These findings may be explained by the fact that, when the mild inaccuracies of the Type Facet distinction meet those of the Time or Orientation Facets, deviations tend to combine and

blur the picture. Hence, we turn to the analyses of the time and orientation facets separately for each sub-domain, that of the urge-based curiosity and that of the interest-based curiosity.

3.2 Testing Time and Orientation Facets Conditional on the Type Facet

3.2.1 Time and Orientation Facet in Urge Ratings

Faceted SSA conducted on the 60 urge variables alone, yielded the results shown in Figure 2.

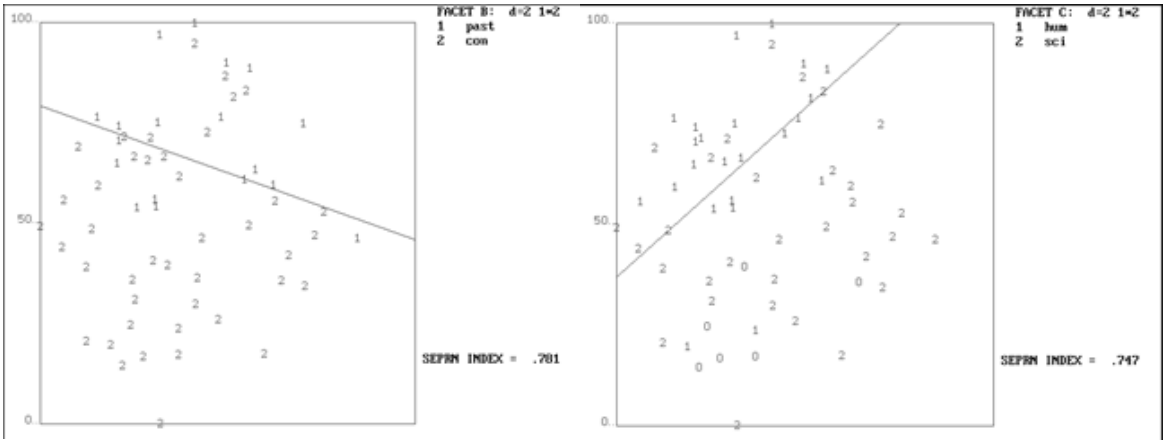


Figure 2. Regional Hypothesis Tests of (a) Time Facet (b) Orientation Facet Faceted SSA of Urge-Curiosity

These results suggest that when focusing on urge-based curiosity evaluations alone, the time and orientation facets separate the content space of curiosity successfully, with relatively high separation indices of 0.781 and 0.747 respectively. These maps confirm the hypotheses that time-reference plays a role in a question's tendency to arouse curiosity in structuring the urge-curiosity space; as does a question's topical orientation (humanities or sciences).

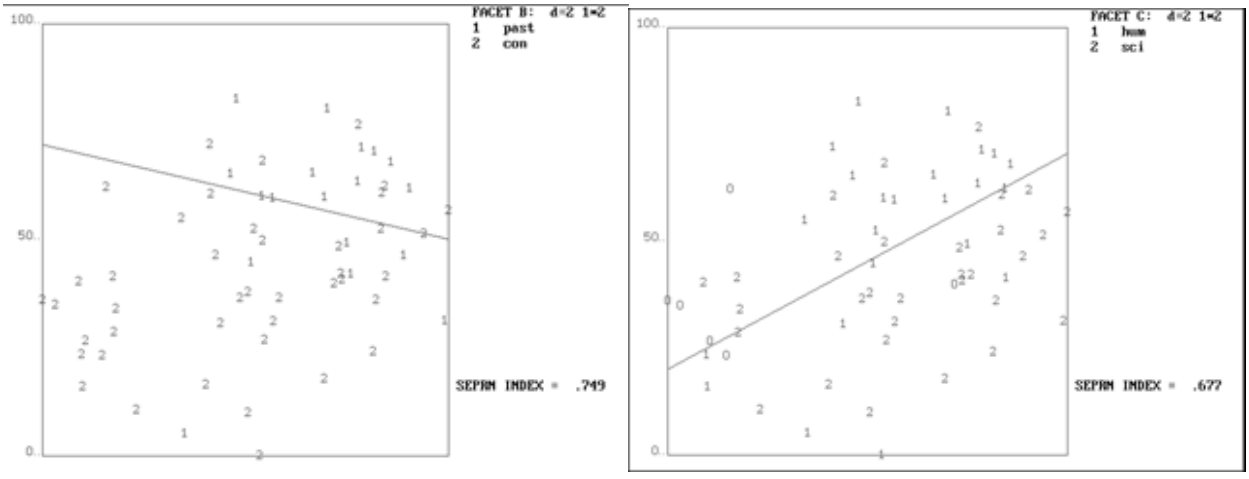


Figure 3. Regional Hypothesis Tests of (a) Time Facet (b) Orientation Facet Faceted SSA of Interest-Curiosity

1.2.2 Time and Orientation Facet in Interest Curiosity

Based solely on interest ratings, the validities of the Time Facet and of the Orientation Facet were established sufficiently well, yielding medium to high separation indices of 0.749 and 0.677 for the time and orientation facets respectively, as can be seen in Figure 3. These results can be viewed as a replication of sorts of the prior analysis, which was done for the urge ratings alone. Thus, we can conclude that while the time and orientation facets, each separates the content space of curiosity to some degree, regardless of whether we examine elicited urge or interest evaluations, they better structure data based on elicited urge or interest ratings.

4. THE MEASUREMENT OF CURIOSITY: PARTIAL ORDER SCALOGRAM ANALYSIS WITH COORDINATES (POSAC)

4.1 Computing Composite Scores for Curiosity Constructs: Past, Contemporary, Humanities, Sciences

It was initially hypothesized that curiosity may be dependent on various factors, such as one's individual preferences for information about certain time periods or disciplines. The above analyses support these ideas by revealing that the time and orientation facets separate the content space of curiosity moderately successfully, especially when testing them on elicited urge ratings. Now, based on these factors, it is possible to measure people with respect to the strength and quality of their curiosity behavior. This can be efficiently achieved by analyzing the data using the POSAC/LSA program.

In this analysis, the elicited urge and interest ratings were dichotomized, in such a way that ratings between 1 to 5 were given the value 1 and ratings between 6 and 10 were given the value 2. Variables that deviated from their assigned region, in either the Time Facet or Orientation Facet or both, were excluded from the POSAC/LSA analysis. Additionally, variables which could not be clearly classified by the time and/or orientation facets, were excluded from this analysis as well (appear as "0" in the FSSA maps). Figure 4 shows excluded items (circled) in the urge ratings maps partitioned by Time and Orientation Facets:

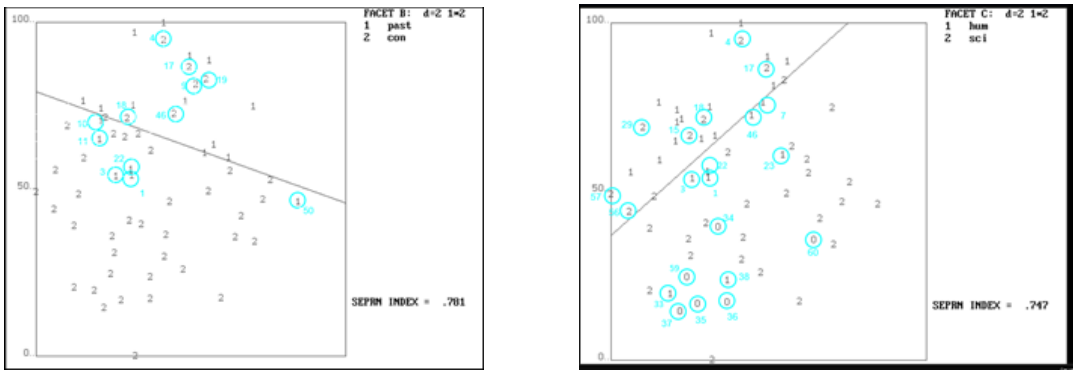


Figure 4. Faceted SSA of Urge Ratings: Items Excluded from POSAC as Deviants or undetermined based on (a) Time Facet Map (b) Orientation Facet Map

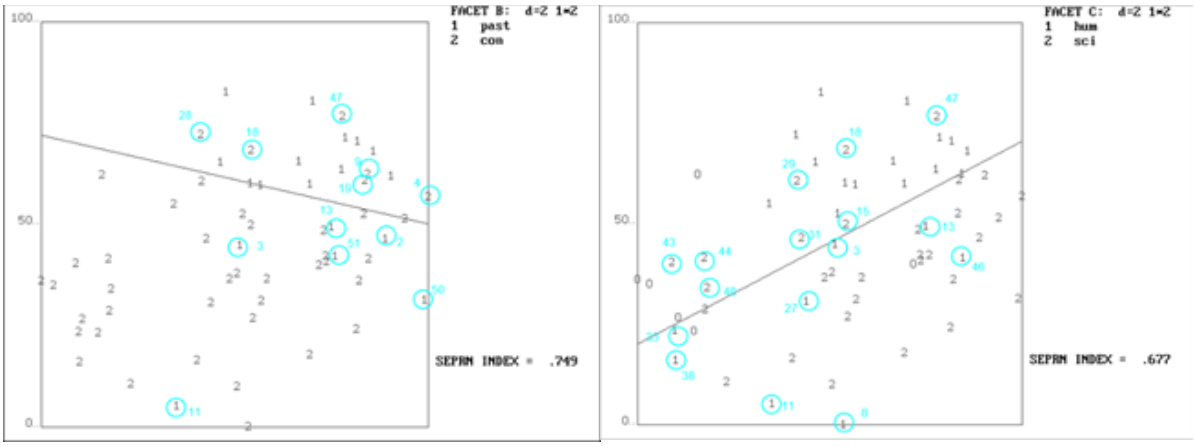


Figure 5. Faceted SSA of Interest Ratings: Items Excluded from POSAC as Deviants or Undetermined based on (a) Time Facet Map (b) Orientation Facet Map

Figure 5 shows excluded items (circled) in the interest ratings maps partitioned by Time and Orientation Facets.
From the set of well-classified variables, four subsets were created according their contents: past-related, contemporary-related, humanities-related and sciences-related; and for each subset (and every individual in the sample), a *composite score* was computed by averaging, and then dichotomizing, the scores of its member-items. An individual's average lower or equal to 1.5 for a variable-subset meant that the participant tended to report relatively low curiosity values for variables of this type, and thus, entailed an individual score of "1" for that subset. An individual's average higher than 1.5 for a variable-subset certain level entailed the score of "2" for that variable-subset.

This entire procedure was carried out separately for the urge-ratings data base and for the interest-ratings data base.

Validated by Faceted SSA as empirically distinct, the notions of *Past, Contemporary, Humanities and Sciences* are taken to represent basic constructs of curiosity, in fact new variables whose values for every individual is given by the respective composite score computed as described above. Thus, each participant's curiosity was assigned four curiosity scores – one for each the construct-variables: past, contemporary, humanities and sciences. These data were then entered into the POSAC/LSA program.
This entire procedure was carried out twice: for the urge ratings data base and for the interest ratings data base.

4.2 Multiple Scaling by POSAC

4.2.1 Urge curiosity

The four scores obtained by an individual on the four composite variables, labelled *past, contemporary, humanities and sciences* constitute now that individual's *curiosity profile*.
The set of observed profiles (also known as a *scalogram*) is analyzed by POSAC in an attempt to obtain a representation of all the observed order relations (comparability as well as

incomparability) between profiles in a lower dimensionality (2) than that of the scalogram (4, in this case).

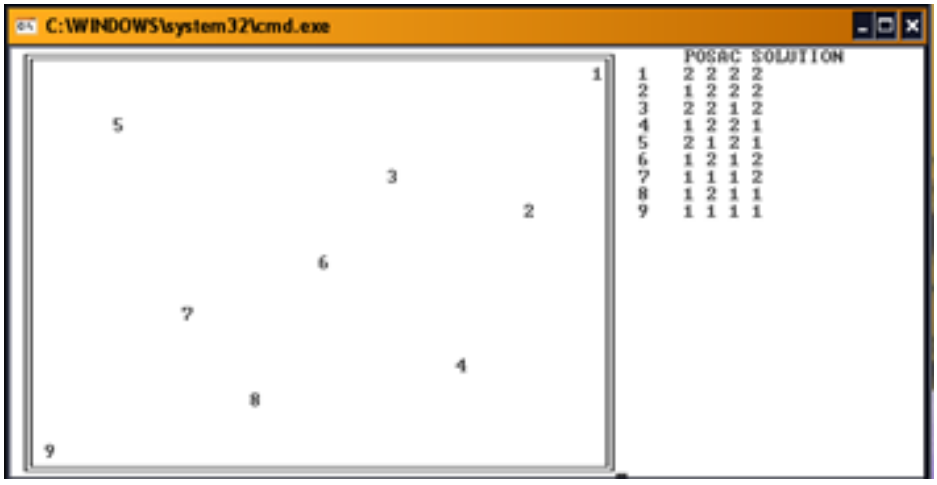


Figure 6. POSAC Solution: Urge Ratings
POSAC Coordinates of Observed Curiosity Profiles Preserve Order Relations between Them (Comparability and Incomparability)

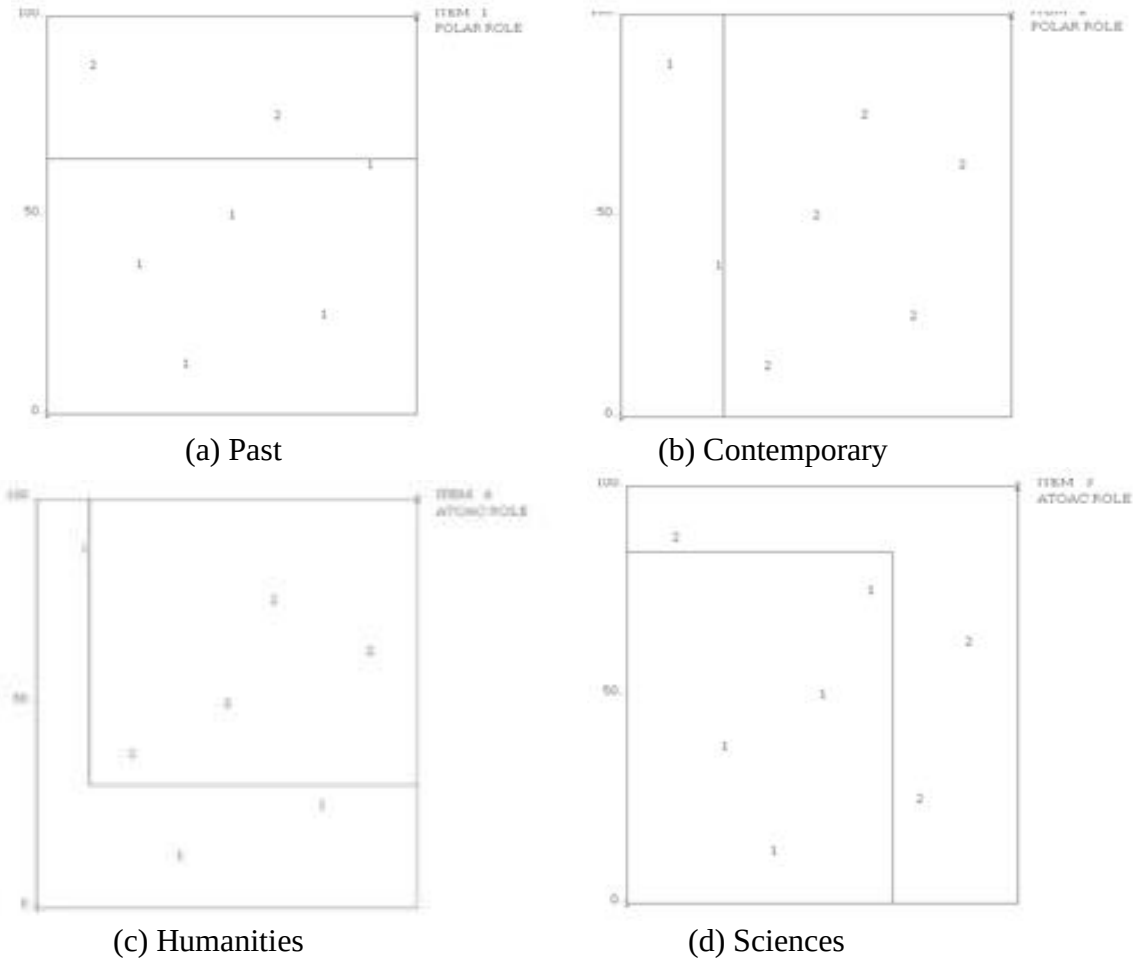
Transforming 4-score profiles into a 2-dimensional coordinate space serves the scientific purpose of parsimony. But to complete the multiple scaling procedure it is necessary to discover the meaning of the two coordinate-scales, regarding them as the fundamental variables that determine empirically observed curiosity behavior. This task is achieved by a piecemeal analysis of the item diagrams partition lines (which must be a nondecreasing step-curves, Shye 1976; 1985), identifying the optimal partition line (or *role*) for each item.

Table 1. POSAC Deviations Table Facilitates the Assignment of Optimal Partition Line to Every Item: Straight Line (Item Polar Role); One Bend Curve (Accentuating/Attenuating Role); Two Bends Curve (Promoting Role); Three Bends Curve (Modifying Role)

ITEM	POLAR		ACC/ATT		PROMO		MODIF	
1	.00	Y	.00	C	.00	Y	.00	C
2	.00	X	.00	C	.00	Y	.00	C
3	50.00	X	.00	C	.00	Y	.00	C
4	50.00	Y	.00	T	.00	Y	.00	C

First, the best fitting *polar* items are identified. Evidently, these are Item 1 (past-reference curiosity) and 2 (contemporary-reference curiosity) for which a perfect (no deviations) straight line is found separating the low value (1) from the high value (2) in each of them. See Figure 7 (a) and (b). Item 1 divides the Y-coordinate of the POSAC space into two intervals representing low and high 'past-curiosity'. Item 2 is found to split the X-coordinate of that space into two intervals

representing low and high 'contemporary-curiosity'. These two items endow the coordinates with the initial, "first approximation" interpretation. In effect, the two partitions, when superposed, divide all respondents into four groups: those low on both past and contemporary curiosity; those high on past and low on contemporary curiosity; those low on past and high on contemporary curiosity; and those high on both, past and contemporary curiosity. Our aim is to further interpret the coordinate-scales, so we proceed to look at the optimal partitions of items 3 and 4, i.e. the humanities and sciences orientations curiosities, respectively. Table 1 tells us that both of them have a one-bend partition-line, the one (humanities) having an L-shaped partition-line is designated as an *accentuating* item (marked by C in the fifth column of Table 1) and the other, having an inverted-L-shaped partition-line is designated as an *attenuating* item (marked by T in the fifth column of Table 1). See Figure 7 (c) and (d).



(a) Past (b) Contemporary

(c) Humanities (d) Sciences

Figure 7. Optimal Item-Role Assignments: (a) Past-Reference Curiosity is Y-Polar; (b) is Contemporary-Reference Curiosity is X-Polar; (c) Humanities-oriented Curiosity is Accentuating; and (d) Sciences-oriented Curiosity is Attenuating

Superposing all four partition lines, Figure 8, each coordinate may be interpreted in terms the semantic significance of each of the interval, as follows:

The X coordinate-scale:

Interval-score 1: profiles of people who are low in past-reference curiosity and also low on science curiosity.
Interval-score 2: profiles of people who are low in past-reference curiosity but high on sciences curiosity.
Interval-score 3: profiles of people who are high in past-reference curiosity but low on humanities curiosity.
Interval-score 4: profiles of people who are high in past-reference curiosity and also high on humanities curiosity.

The Y coordinate-scale:
Interval-score 1: profiles of people who are low in contemporary-reference curiosity and also low on science curiosity.
Interval-score 2: profiles of people who are low in contemporary-reference curiosity but high on sciences curiosity.
Interval-score 3: profiles of people who are high in contemporary-reference curiosity but low on humanities curiosity.
Interval-score 4: profiles of people who are high in contemporary-reference curiosity and also high on humanities curiosity.

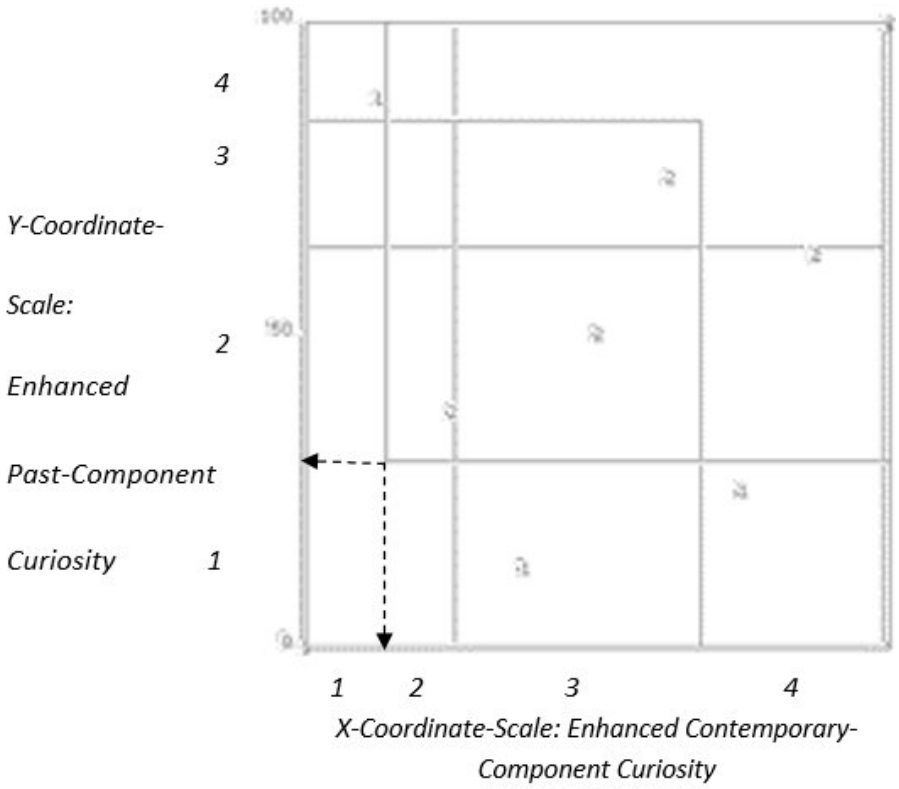


Figure 8. POSAC Measurement Space of Urge-Type Curiosity Featuring Two Necessary and Sufficient Scales: *Enhanced Past Curiosity* and *Enhanced Contemporary Curiosity* as Fundamental Variables for Respondents' Curiosity Behavior

The meaning of a coordinate scale, say, X, as a newly discovered fundamental variable of curiosity is in fact a semantic juxtaposition of the meanings of the intervals so as to integrate them into a conceptual construct that underlies curiosity behavior. We labelled this yet unnamed construct *Enhanced Contemporary-reference Curiosity Scale* because it based on the notion of contemporary-reference curiosity as the dominant meaning of the X coordinate, enhanced (or refined) by the humanities and sciences curiosities. This refinement is expressed in introducing the 4-score graduation on the coordinate scale.

And the same goes for the past-reference curiosity coordinate scale Y.
It is instructive to look at the POSAC measurement space in Boolean terms.
A Polar Item (past, or contemporary) divides its respective coordinate into two parts which determine whether a respondent failed or passed given the threshold of composite variable dichotomy.

The value *high* in an attenuating Item (Sciences) ensures some minimum value in *both* X AND Y, even if those minima do not exceed the threshold required for high position in any of polar items. A person who is high in the attenuating curiosity item has a little of both.

The value *high* in an accentuating Item (humanities) ensures extremely high values either in X OR in Y (or in both), and it can occur only if in at least one polar item the threshold is exceeded. A person who is high in the accentuating curiosity item is at the top of one of the coordinates, at least.

4.2.2 Interest curiosity

When analyzing the data based on interest ratings alone, POSAC results replicate some of the urge-based findings: in this case as well, curiosity about the past and the contemporary references were found to play polar roles, determining the dominant meaning assignable to the two POSAC coordinates. Thus, the partition of the POSAC space into four regions, representing the four groups of respondents (those low on both past and contemporary curiosity; those high on past and low on contemporary curiosity; those low on past and high on contemporary curiosity; and those high on both, past and contemporary curiosity) has been replicated. The two coordinate scales represent indeed past-reference and contemporary- reference curiosities, which serves to assess people as high or low in each coordinate scale. The analysis reveals however, that in this case of interest-based ratings, curiosities about humanities-oriented and science-oriented topics, do not play a clear accentuating or attenuating role, or indeed any other clear role in partitioning the space. Hence, they could not reliably serve to refine the POSAC coordinates.

2. CONCLUSION

The domains of urge-curiosity and interest-curiosity exhibit a basic similarity in their structure (as evidenced by Faceted SSA). Moreover, in the more detailed analysis of multiple scaling by POSAC again, the most dominant aspects of this analysis, namely the determination of the polar items which provide the essential meanings to the coordinate-scales, turn out to be identical in both curiosity types. However, in the subtler aspects of POSAC, those that serve to refine the measurement scales beyond the first order interpretation, urge-curiosity exhibited very orderly and easily interpretable scales, while interest-curiosity did not. Evidently the notion of interest,

representing a cognitive rather than affective behavior modality, may require further examination especially with regard to finer differentiations that comprise it.

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USING POSAC TO REVEAL THE HIERARCHICAL STRUCTURE OF BODY IMAGE

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ABSTRACT

What is the internal hierarchy of the body image? Our 44 female participants ordered 8 composite images comprising a Torso (thin vs. large) × Leg (thin/large vs. medium) × Arm (thin vs. large) design, from thinnest to largest. Looking at only the first five ratings, this set of truncated profiles comprises a scalogram. The 2D POSAC space neatly portrays these data: (1) the profiles lie on the top-left to bottom-right diagonal, indicating a unidimensional mapping; (2) when focusing on the listing of images appearing in the third ordinal position, a lawful partitioning can be seen using parallel stripes perpendicular to this diagonal, indicating the hierarchical structure of the body image.

INTRODUCTION

What is the internal hierarchy of the body image? Does one focus on the extremities (legs, arms) prior to more central regions (head, torso)? Or, does one move outwards from the center? Areas of focal interest would include the torso (Gendebien & Smith, 1992; Irvine et al., 2019), the legs, and the arms (Hewig et al., 2008; Rodway, Tatham, & Guo, 2018). The torso (specifically, the chest) is perceived as being more significant than either the arm or the leg (Morrison & Tversky, 2005).

To investigate this rather neglected area of research, we employed images taken from the familiar *Photographic Figure Rating Scale* (PFRS; Swami, Salem, Furnham, & Tovée, 2008a, 2008b). These were divided into torso, legs and arms, from which we could construct composite images for our participants to inspect, and then to rank-order these from the thinnest to the largest body shape. A rank-ordering, or card-sorting, task has previously been employed to uncover the hierarchical structure of a data set (Avital & Cupchik, 1998), and to "allow the natural structure of conceptual systems to emerge" (Gabe-Thomas, Walker, Verplanken, & Shaddick, 2016, p. 3). With respect to the body image, such a task has been employed to order female body photographs in terms of increasing BMI (Schuck, Munsch, & Schneider, 2018), and to order various body parts (e.g., arm, leg) in terms of significance (Morrison & Tversky, 2005, pp. 700-701). Hence, the purpose of this rank-ordering task in our study is to uncover the hierarchical structure of the body image.

How should one analyze such rank-ordering data? In ordering the images from thinnest to largest, an individual profile is generated. The set of profiles created will be analyzed using scalogram analysis (Shye, 2007).

METHOD

Forty-four female undergraduate university students participated in this study (Naor-Ziv, King, & Glicksohn, 2020). Here we focus on one task that we gave them: to rank-order a series of 8 composite images. The 10 PFRS images are calibrated with BMI, as follows: Image 1 (BMI = 12.51); Image 2 (BMI = 14.72); Image 3 (BMI =16.65); Image 4 (BMI = 18.45); Image 5 (BMI = 20.33); Image 6 (BMI = 23.09); Image 7 (BMI = 26.94); Image 8 (BMI = 29.26); Image 9 (BMI = 35.92); Image 10 (BMI = 41.23), as reported by Swami et al. (2008b). Image 2, Image 5, and Image 8 were manipulated using Adobe Photoshop, set to 600 pixels per square inch for all stages. These images, which are equidistant on the PFRS, were chosen to be representative of thin, medium, and large body shapes. Each was divided into torso, legs, and arms, and these body parts were saved as individual images (130 mm × 130 mm). These isolated body parts were used to construct 27 composite images, each placed on a black background, and slightly edited to appear more real. A total of 8 were chosen for the rank-ordering task, based on a Torso (thin vs. large) × Leg (thin/large vs. medium) × Arm (thin vs. large) design. These images appear in Figure 1. The images were printed on separate cards. These were presented to the participant in a random order (achieved by shuffling the cards before the participant). The task presented to the participant was to order the images from thinnest to largest.

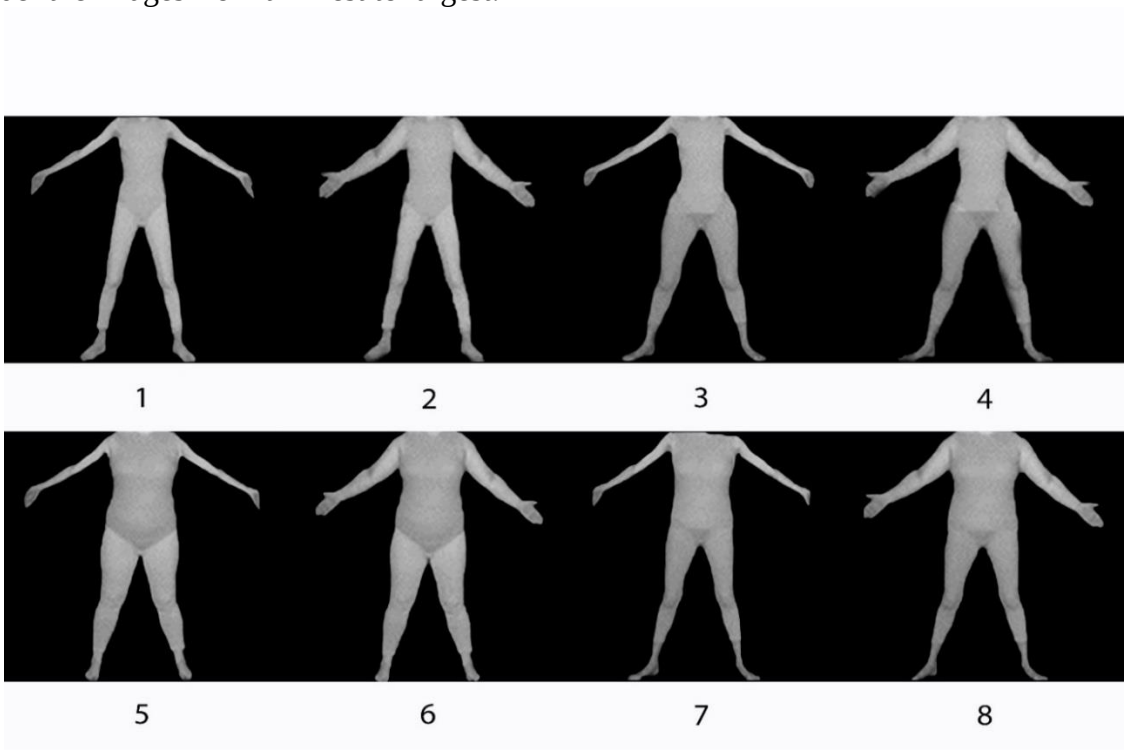

Figure 1: **The 8 images used for the rank-ordering task.**
Image 1 (= thin torso, thin legs, thin arms); image 2 (= thin torso, thin legs, large arms); image 3 (= thin torso, medium legs, thin arms); image 4 (= thin torso, medium legs, large arms); image 5 (= large torso, large legs, thin arms); image 6 (= large torso, large legs, large arms); image 7 (= large torso, medium legs, thin arms); image 8 (= large torso, medium legs, large arms).

We employ partial order scalogram analysis by coordinates (POSAC) procedure, as described by Shye (2007), which maps these profiles into a 2D representational space, such that the basis for

partitioning this space indicates whether the body image has a unidimensional mapping or requires two dimensions, and what those dimensions reflect in the data.

RESULTS

On looking at the individual profiles, we note that 41 of our 44 participants agreed on the thinnest image, this being image 1 (thin torso, thin legs, and thin arms). Given the nature of our rank-ordering task, the individual profile generated necessarily presents correlated choices. To alleviate this situation, we look at only the first five ratings.

This set of profiles comprises a scalogram (Shye, 1998, p. 163). Figure 2 is the 2D space in which the various profiles can be mapped, as provided by the POSAC module of Hudap (Shye, 2007). The POSAC space takes into consideration "each profile's empirical frequency" (Sabbagh, Cohen, & Levy, 2003, p. 330); these frequencies are indicated in Figure 2.

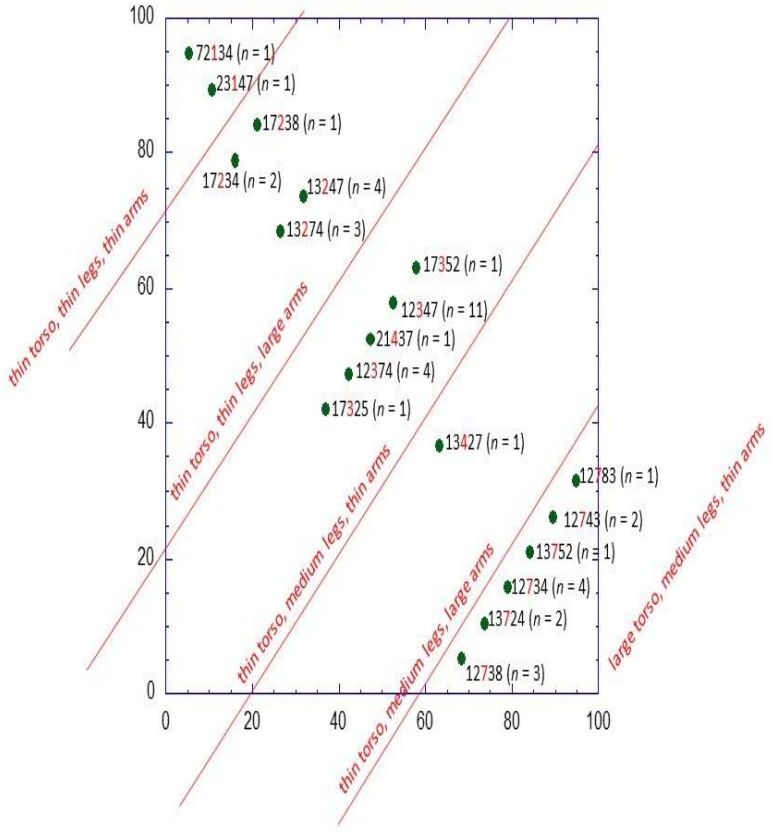

Figure 2. POSAC space in which the various profiles can be mapped, with these appearing along one diagonal.

Note the following: (1) the profiles lie on the top-left to bottom-right diagonal, indicating a unidimensional mapping (Merschrod, 1980, p. 636), hence one does not need to consider the 2D coordinates (Dancer, 1990, p. 488); (2) in an attempt to interpret this space, note that a lawful partitioning can be seen when focusing on the listing of images appearing in the third ordinal position; (3) the space can be partitioned using parallel stripes (Shye, 1998, p. 165) perpendicular to this diagonal, and when these are interpreted in terms of the image appearing in the third ordinal position within the profile they indicate the hierarchical structure of the body image; and (4), a participant exhibiting aberrant performance on the task lies at the top left of the diagonal.

DISCUSSION

POSAC should be useful in analyzing profiles comprising a number of different measures—in the present context those that are used to assess the body image—in order to further understand the nature of that construct (Guttman & Greenbaum, 1998, p. 27). But as shown here, POSAC can also be useful when employing a *single* measure, if an appropriate methodology is employed, such as a rank-ordering task. A 2D representation was found to be adequate both for our data and for the data reported by Böhm and Pfister (1996) for their rank-ordering task—though they had two dimensions to interpret (an emotional dimension and an evaluative dimension). If "the substantive interpretation of the POSAC X, Y coordinates is the major challenge of multiple scaling by POSAC" (Kedar & Shye, 2015, p. 99), then surely the interpretation of a *single* diagonal should be somewhat simpler.

The 2D POSAC space neatly portrays our data and allows us to reveal the hierarchical structure of the body image. Indeed, the unidimensional mapping indicated by the top-left to bottom-right diagonal is readily interpreted (Shye, 1987, p. 268). As Sorochinski and Salfati (2018, p. 69) have indicated, "the qualitative differences" are represented along this diagonal, as is indeed expected from a hierarchical structure. Thus, the hierarchical structure that we uncover is: first torso, then legs, then arms. This hierarchy becomes most effective for the third ordinal decision made by the participant in rank-ordering the images.

One might consider comparing this multidimensional scaling approach to one addressing the existence of clusters in the data. Indeed, as Shepard (1980, p. 397) has argued, "different methods of analysis may be better suited to bringing out different, but equally informative aspects of the underlying structure…." The plausibility of embedding a clustering solution within a 2D POSAC space is clearly in line with Shepard's (1980) work. But, as we have shown recently (Naor-Ziv et al., 2020) and as emphasized below, the 2D POSAC space in the present case was more revealing of the hierarchical structure of the body image than was the cluster analysis.

Could this be a result of the appearance of aberrant behavior on the rank-ordering task? Participant #11 chose image 7 as being the thinnest, and this participant is clearly seen at the top-end of the diagonal appearing in POSAC space. Participants #34 and #40 both placed image 2 in first rank order of thinness, and one of these appears next to participant #11 in the POSAC space. In fact, all three of these participants belong to the same cluster. Aldenderfer and Blashfield (1984, p. 61) have recommended that "outliers should be identified before cluster analysis is used, and each should be carefully evaluated to determine the reason it is so different from the other cases." We

suggest that rather than removing such outliers at the outset, the juxtaposition of the two analytic procedures enables one to uncover such outliers in a data set. Interestingly, while Raveh and Landau (1993, p. 85) had suggested that POSAC is "a robust method against outliers", our data suggest that POSAC will actually help to identify such outliers—and this can be beneficial for future work.

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ANALYSING BIRD BEHAVIOUR: A REVISED FACET THEORY ANALYSIS OF COGNITIVE PERFORMANCE IN NEW ZEALAND ROBINS (*PETROICA LONGIPES*)

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ABSTRACT

Hereunder we analyse of the cognitive performance of New Zealand robins (*Petroica longipes*) using smallestspace analysis and partial order scalogram analysis with base co-ordinates using a data set was originally analysed using principle component analysis. We propose a two facet, rather than a single principle component, solution and we characterized individual birds by their scores on all tasks. We survey attitudes about how we talk about birds and propose a revised mapping sentence for avian cognition based on these. We call for replications of our study using a larger sample of birds and for the development of further test items. We suggest that facet theory and the mapping sentences are research approaches suitable for avian cognitive research.

INTRODUCTION

Birds can fly, as can many other types of creatures such insects. The ability to fly has long fascinated human beings who have sought to emulate this capability. However, birds are typically larger than insects, birds also have faces that are analogous to our own and birds engage with us in a way that insects typically do not. Indeed, as I write this paper there is a pair of wild Mallard's (*Anas platyrhynchos*) sitting a few metres away from me on my back porch here at home. The birds are aesthetically coloured and shaped and I feel privileged to have them share the morning with me: I doubt that I would feel this way if they were insects. Many species of birds have become domesticated and yet other bird species we farm. The point we are making is that we are aware of birds all around us and this awareness often contains fascination. Perhaps as a consequence of our interest and captivation by birds avian cognition research and research into other forms of bird behaviour has long and rich history (see, Hackett, 2020). However, the avian researcher has additional difficulties when attempting to study cognitive processes in birds that the counterpart researcher who is interested in human cognition does not face. The first major hurdle that somebody attempting to understand how birds think, feel and behave is the fact that birds cannot be asked to report upon their condition. Therefore, avian cognitive scientists have to develop and devise intricate methods or tasks in an attempt to assess such behaviour. Scientists also have a similar problem as human behavioural scholars in that laboratory based behaviours in birds may be completely unrepresentative of their usual abilities and may not be generalised to their performance in their usual habitats. Another problem with generalising to populations from samples is also faced by the avian scientist because the sample sizes they work with are often case-studies or involve very small numbers. Furthermore, the samples of birds that they use and not in any sense form a representative or random sample of the populations from which they are drawn: Nothing is known regarding how the birds who take part in a study relate to or represent the populations of birds from which they are drawn (see, Shaw and Schmelz (2017) for a consideration of sample sizes and other issues in avian research).

With all of these caveats in mind, colleagues of the first author at Cambridge University and at institutions in New Zealand and Europe gathered a set of data from New Zealand Robins (*Petroica longipes*) (Shaw, et al, 2015) on a series of cognitive tasks. The data set was seminal in the avian cognition literature for two reasons. First, it was cognitive assessment data that was gathered by volunteer birds in the locations in which they lived in the wild. Such a sample addresses the above mentioned problem with the behaviours exhibited by laboratory based birds who are trained to perform tasks may be exhibiting behaviours and ability that do not transfer to understanding behaviours in natural settings. However, the caveats that I issued above regarding the size and representativeness of the sample were not addressed by the sampling in this research. Secondly, the research was undertaken to assembled an avian cognition test-battery.

TEST BATTERY AND SAMPLE

The test battery was given to twenty free-flying adult New Zealand Robins (*Petroica longipes*) (males 14, females 4, sex unknown 2). However, before the completion of the testing 3 birds went missing resulting in 17 complete sets of data. Human intelligence tests are typically comprised of a series of individual tests that are designed to assess underlying cognitive constructs. For example, an object assembly test is designed to assess the latent construct of spatial reasoning whilst also accessing hand-eye co-ordination and motor skills. Unlike with human psychometric tests the avian test battery was made up of six tasks that each of which addressed a specific cognitive process and also required motor skills. This dependency on motor abilities was due to the fact that in order to achieve a response to a task a bird had to 'perform a motor task as they were unable to demonstrate a cognitive related ability in any other way. The six tasks were given to the birds in the following order: (1) motor task; (2) colour discrimination; (3) colour reversal; (4) spatial memory; (5) inhibitory control; and (6) symbol discrimination. The performance of all of these tasks were measured in terms of trials before meeting a pre-determined criterion that indicated successful completion.

PRINCIPLE COMPONENT ANALYSIS

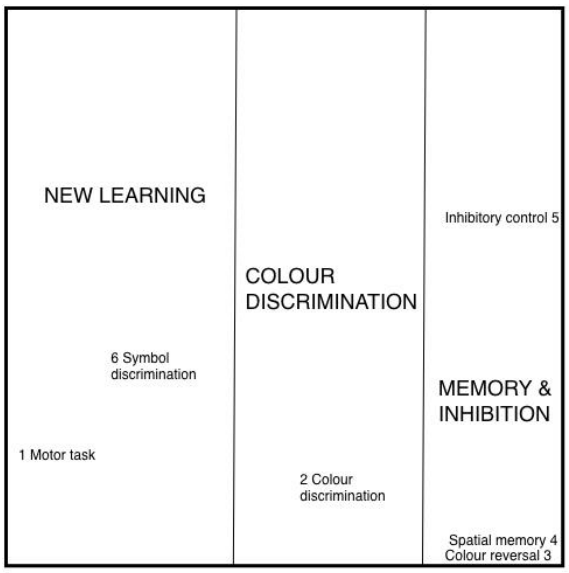
Shaw and C`olleagues (2015) conducted a principal component analysis of the data set and discovered a first component that accounted for 34% of variance in the robins' performances on all six tasks. Four tasks loaded heavily on this first component, whilst the two task performances that did not load heavily upon the first component, motor task and symbol discrimination, loaded positively on a second component which accounted for a further 14% of variance and together the two components accounted for 59% of total variance in the data set. The loadings of the two components were as follows: Spatial memory (4), **0.727 ,** 0.184; Inhibition (5), **0.695,** 0.333; Colour discrimination (2), **0.660 ,** 0.084; Colour reversal (3), **0.631 ,** 0.274; Motor task (1), 0.231, **0.887;** Symbol discrimination (6), 0.411, **0.673**. (Task order number in parentheses, loading above 0.6 have been emboldened) (adapted from Shaw et al. (2015)). The two principle components had Eigenvalues of: 2.067 and 1.466, and accounted for: 34.46% and 24.44% of the variance.

FACET ANALYSIS

Greggor and Hackett (2018) and Hackett (2020) have spoken about the use of facet theory in avian research. In Hackett, et al, (2019) the above data set was analysed using the facet theory analysis techniques of smallestspace analysis (SSA) and partial order scalogram analysis (POSAC).

Smallest Space Analysis (Two-facet solution)

When attempting to assess human intelligence test items have been developed that assess a series of different abilities where these are designed to be highly inter-correlated (Guttman and Levy, 1991). The SSA conducted by Hackett, et al (2019) produced an extremely accurate two facet solution (CoA (0.00)) with the intercorrelations between all items were either positive of varying degrees of had 4 very small negative associations. The negative correlations suggested that motor task was accessing a slightly different type of performance to the remaining tasks. The first facet in this analysis had three distinct elements in an axial arrangement. These elements reflected different task types and were labelled by the researchers: new learning, colour discrimination and memory and inhibition. There was an ordered difference between the tasks as shown by the axial arrangement of elements. In this configuration colour discrimination fell between and was related to both memory / inhibition and new learning (figure 1).



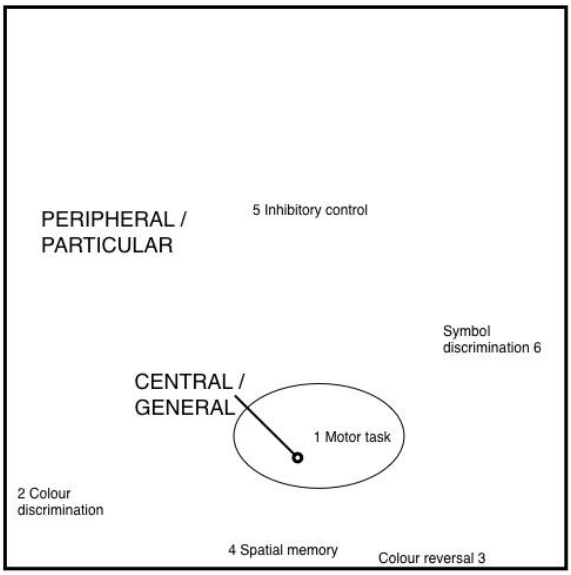


Figure 1 **Figure 2**

Space Diagrams for Two-Facet SSA: Task-Type Facet (left) and Focus Facet (right) (Hackett, et al, 2019)

In the same analysis Hackett, et al. (2019) found a second facet this time with a modular structure facet (figure 2). The structure of this facet indicated that some skills that the birds performed were more central/general and others more peripheral/particular. What the authors meant by this labelling was that the centrally placed motor task reflected that this skill was highly correlated with the performance of all other tasks. The central positioning of motor task indicates this inter-correlation. Hackett, et al, (2019) noted how the location of the motor task at the centre of this

facet reflected the fact that all birds were initially trained to perform the motor task in order that they would be able to perform the five other tasks. However, the researchers were unable to account for the positioning of the five tasks in the peripheral element of this facet.

Based upon the two facets in figures 1 and 2, Hackett, et al, (2019) combined the two facets into a cylindrex to indicate how the effects of the two facets combined and interacted together with the focus facet with elements of central and peripheral tasks arranged the motor task centrally in relation to all other tasks whilst the relationship of the two facets was orthogonal as they were present in two separate SSA plots (figure 3).

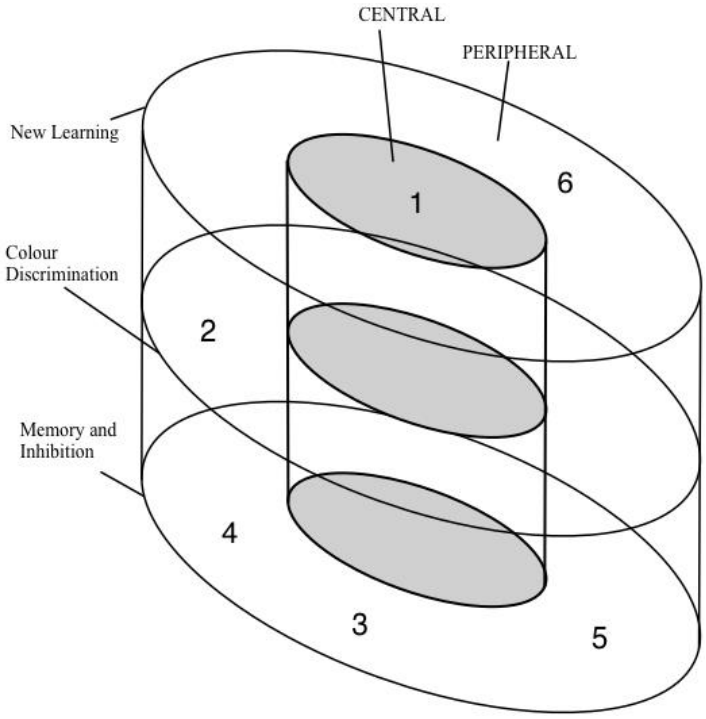


Figure 3. Two-Facet Cylindrex (Hackett, et al, 2019)

The research by Hackett, et al, (2019) clearly extended the knowledge that was implicit in the initial principle component conducted by Shaw, et al (2015). It did this through the depiction of two facets that accounted for the variance in the correlations between tasks with two facets that indicated the nature of the relationship between the facets. This is a significant methodological extension of the use of the facet theory approach with non-human animals and also a significant development within the area of avian cognition. Furthermore, the use of non-parametric statistics and inter-item distances rather than the fitting of regression lines in determining the position of items in SSA, is likely to more accurately reflect the psychological nature of these constructs.

ANALYSIS AND RE-NAMING OF ELEMENTS IN SSA

However, the labelling of facets and their elements can be problematic, and this is especially the case when the labels are attempting to accurately reflect the psychological processes of a non-human animal. After talking to colleagues, I was not totally comfortable with the labelling of the elements in the task-type facet. I therefore conducted a brief open-ended qualitative survey with five individuals who were chosen to reflect their knowledge and experience of watching bird behaviour. The specific skills this group possessed included: working in an Osprey conservation scheme, being a significant Caribbean ornithologist, being an avian behavioural scientist, being an experienced US birdwatcher, being an experienced birdwatcher, botanist and agricultural scientist. These individuals were shown the SSAs in figures 1 and 2 and the structure of these were described to them and their understanding of these was checked. They were then asked to make comments about the names of the facet elements and its structure. This produced the following summary of the responses.

Audience Important

One person commented that the names of the facets and the research itself was appropriate for researchers with an understanding of bird behaviour in the field but that the terms may benefit from simplification for twitchers and amateur ornithologists.

Importance of Discrimination

Discrimination was identified as being very important in many aspects of avian cognitive behaviour. For example, one respondent said that she was fascinated by the neural abilities of birds to discriminate and execute their mental acuity in the choices they make in their day to day lives. Comments were also made that humans use colour and shape discrimination to distinguish between different bird species.

Importance of observation

There was a belief that all birds think and feel but that this can most easily be identified in species such as Corvids and birds of prey. Observation can reveal that the birds are attempting to mentally solve problems and they chose from a variety of responses including expressions of anger and anxiously feeding. Another respondent emphasised the importance of observation when they said that the best person to ask about the behaviour of a bird was one who worked directly with that bird and had directly witnessed the bird's behaviour. Through observation one respondent listed the types of behaviour that could be observed and attempts made to understand these: what's it doing? - flying, walking, eating, sitting, singing; Its movement - Flying - gliding, hovering, dipping, flapping, Walking - waddle, hop, walk. Eating - pecking seeds, digging for worms, pulling at fish or meat; Sitting - still, actively looking, perched; Singing - head up, straight ahead, beak movements.

Mental Activity / Birds as Individuals

It was commented that through “looking extra hard” it was possible to identify individual (large) birds. This could be achieved due to markings, shape, characteristic movements, personalities that can be seen to emerge when working with chicks. Different birds react differently to different people handle them. Different birds behave differently with people they know compared to strangers. It was commented that mental activity describes the birds ability to “think" about how to build a nest, what materials to use, where to obtain food / water, how to camouflage nests, etc. Furthermore, it was noted how some birds, such as Cockatiels, vocally communicate with humans and raise or lower their head crest when they are startled, angry or excited.

Physical Manipulation / motor skills

Both the ways in which birds move and the way they manipulate items were mentioned. Comments included, for example, that birds move their bodies in many ways during: food gathering, nest building, infant care, etc. Different bird species have different physiologies that allow different behaviours: hummingbirds have a skeletal structure to enable hovering; some birds are adapted frozen conditions; owls are able to turn their heads practically 270 degrees; they have 14 vertebrae in their neck so they are able to view all around them. They are farsighted and have good night-time visual acuity but they cannot see well close up so they use "feelers" on their beaks to know when they caught their prey. The link between a bird’s body and its actions was stressed as was the link between their ability to physically adapt to their environment and behaviours such as seasonal migrations. It was felt that dividing the behaviour of birds into categories may help to understand this, in terms of individual birds and groups. It was also noted that this assists in the identification of individual birds or bird species. After gathering and analysing the survey data I spoke with respondents about the names used to describe the two facets in the SSA reported above. It was agreed that the focus facet was appropriately named but there were some difficulties expressed with the task-type facet. It was felt that the facet should be renamed **ability type** and that the elements should be renamed **physical manipulation, discrimination** and **mental activity**. One of the tasks, symbol discrimination, was relocated into the discrimination element. The resulting SSA plot can be seen in figure 4.

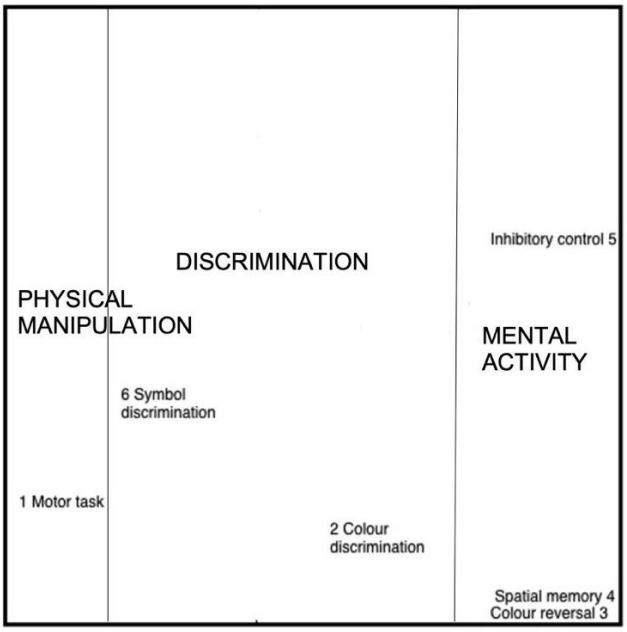


Figure 4. Space Diagram for Two-Facet SSA: Ability-Type Facet

As the second facet of focus remained unchanged, I am not reproducing this here, but I refer the reader back to figure 2 for reference. However, as the task type face was renamed along with its elements, the cylindrex that demonstrated the combination of the two facets has also been updated and this is shown in figure 5.

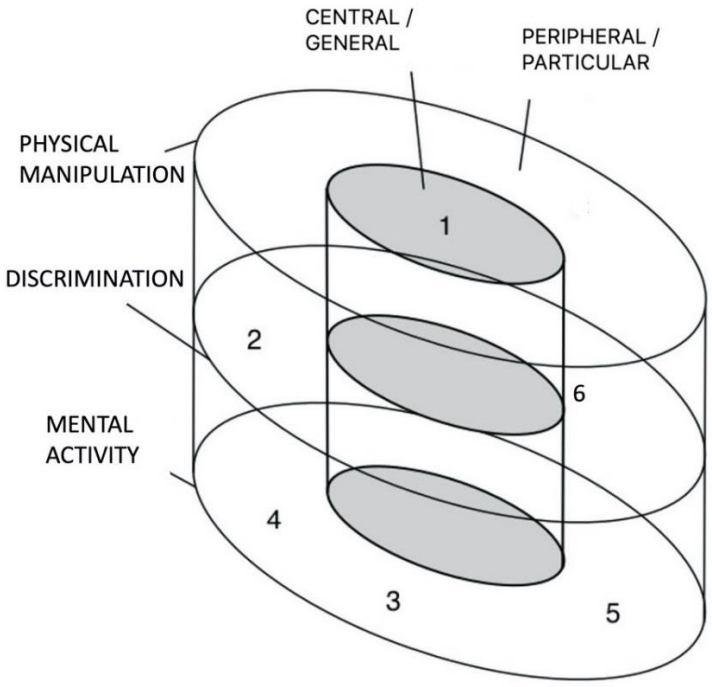


Figure 5. Revised Two-Facet Cylindrex

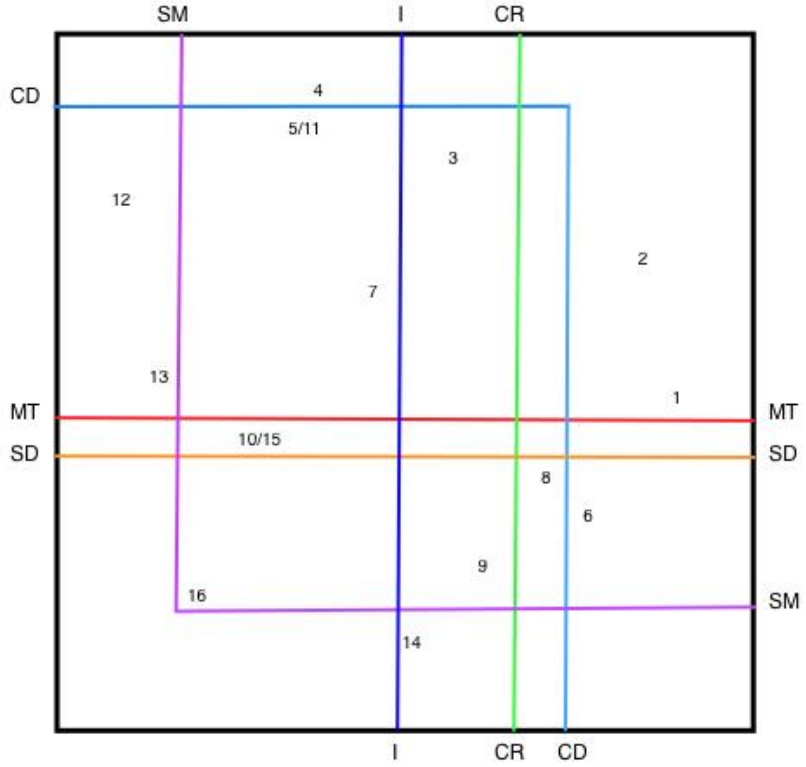
The choice of appropriate names for a facet and its elements is extremely important for all facet theory-based research and this is obviously the case in the present re-naming. However this valence is increased as the names of categories of birds' behaviours has to be aware of two doctrinaire tendencies, both of which are based upon the importation of prejudices to the naming process that are based upon beliefs regarding a bird's abilities. The first of these proclivities is anthropomorphism. Under this outlook bird the behaviour is understood and labelled through the use of human characteristics and abilities. For example, a bird may be said to smile or to look happy or surprised. It may be the case that the behaviour and experience that is being spoken about is indeed appropriately described by these words, but we cannot assume this is the case. It is also of course that these labels are totally inappropriate for describing the avian behaviour. The second tendency assumes the opposite position and is based in the unsupported use of rational reductionism. On such an understanding a bird's behaviours are reduced to the observable components and no psychological or mental activities are assumed to underlie these. This sees the bird as no more than a stimulus – response automaton and the notion of a bird choosing, employing conscious discernment or experiencing emotions are not allowed for. This position may see itself as rational but it is supported by religious dogma that portrays non-human animals as being of a separate form of life to human life on which an understanding no similarities are present between human animal and non-human animal behaviour. It would appear to the author that the religious position may be discounted and that the two extreme positions are inappropriate: Elements of both positions are most useful when attempting to understand the behaviour of birds.

With the above caveats in mind the re-naming of the **abilities type** facet and its elements allows for the purely observable **physical manipulation** types of behaviour in birds that are associated with cognitive performance in birds. The other two elements of **discrimination** and **mental activities** reflect the psychological process that underpin avian behaviour.
Below in figure 6 is a revised mapping sentence for avian cognitive performance. This incorporates the change in facet name and elements in the abilities facet. These alterations, along with modifications in the connective ontology of the mapping sentence are in accord with the survey data commented on above. The changes also ensure that the mapping sentence represents avian cognition form a position that is neither too anthropomorphic nor overly rationally reductionist.

		Abilities type	
		(physical manipulation)	
In completing the cognitive task, Robin (x) uses:		(discrimination)	
		(mental activities)	
	Focus		
Types of abilities, that are:	(peripheral/particular)		to the completion of a specified task,
	(central/general)		
	Range		
	(correct)		
which is assessed to be: (to)			
	(incorrect)		

Fig. 6. Revised Mapping Sentence for Avian Cognitive Performance
Partial Order Scalogram Analyses

As well as SSA, Hackett, et al, (2019) also performed a POSA of the data set which plotted individual birds in terms of their behaviours (figure 6).



Legend

Task	Abbreviation	Colour	Number in SSA plots
Motor Task	MT		1
Colour Discrimination	CD		2
Colour Rerversal	CR		3
Spatial Memory	SM		4
Inhibitory Control	I		5
Symbol Discrimination	SD		6

Figure 7. Partitioning for POSA (Hackett, et al, 2019)

The two axes in the Hasse diagramme in figure 6 run from the bottom left to top right and from bottom right to top left of the diagramme. Along the first of these dimensions, birds are positioned in terms of their summated scores on all tasks. The bird that achieved the lowest summated score (bird 16) is found at the bottom left of this plot whilst the birds with the highest summated scores (birds 1 to 4) are towards the top right. Along the second axis birds that had similar responses to specific tasks were located close together within exclusive regions. The lines that were drawn capture similar scores on each task are indicated by different colours. Hackett, et al's (2019) analyses show that the motor task (MT) and symbol discrimination task (SD) were partitioned with horizontal lines that divide space into vertical regions showing that the cognitive performance of these tasks are in some ways similar to each other. Inhibition control (I) and colour reversal (CR) tasks partitioned space in the diagram in the opposite direction to the MT and SD tasks and demonstrate that MT and SD are tasks that are relatively independent

compared to I and CR. Spatial memory (SM) and colour discrimination (CD) partitioned space into "L" of inverted "L" regions and showed these to have a moderating role in association with tasks that were partitioned either vertical or horizontally. The two moderating tasks were partitioned space in opposite orientations and had a moderating effect in opposite directions to each other.

CONCLUSIONS

Hackett, et al (2019) demonstrated how a SSA solution with two-facets described the variability in the performances of a sample of birds on a cognitive test-battery. These authors discovered an axial facet which they called task type. The facet had three elements of new skill learning/visual shape; colour discrimination, memory and inhibition. The authors also discovered a second facet that acted as a focus facet. This facet divided tasks into elements that suggested that some tasks were more central to overall cognitive performances in the birds than were others. In this paper we have reported a re-naming of the axial facet based upon a survey conducted with individuals who work with birds both professionally and as amateurs. The facet was re-named as Ability-type and the elements as physical manipulation, discrimination and mental activities. Hackett, et al, (2018) stated that facet element names were chosen so as they would reflect the tasks that composed each element, but they noted that these were initial propositions. Our survey has led to changes in the naming and composition of facet elements, but as with the initial research (Shaw, et al, 2015; Hackett, et al, 2019) further research is necessary with a greater number of items both birds and test/task items in order to provide support for or to further modify the facet structure. The problem with a small, non-random, non-representative sample size is that such an analysis is prone to overfitting, where an analysis fits too exactly to a specific data set and reliable predictions to other situations cannot be made. Adopting a facet theory approach cannot remove the problem of overfitting but may mitigate against this in its production of a mapping sentence template which may be used in the future to design and analyse research into avian cognition. The difficulty with the small number of test items is that each of these may address a very discrete ability or skill making the identification of latent or underlying abilities problematic. However, the SSA and POSA results that have been reported suggest an underlying structure for avian cognition. Further test items need to be developed using the revised mapping sentence (figure 6) in order to assess the veracity of the mapping sentence's facets and elements in order to advance our understanding of avian cognition.

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A SCALE FOR THE EVALUATION OF JEWISH-ARAB ENCOUNTERS: DEVELOPMENT, DESCRIPTION AND VALIDATION

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ABSTRACT

Planned Encounters between Jewish and Arab children and teens in Israel is one of the most common intervention strategies in projects aimed at reducing inter-group tension and peace building. Despite many years of experience in operating such projects and the evaluation studies conducted, no justified battery of scales with reasonable reliability and validity, which can advance the accumulated knowledge in this field, has been formed to date. The current study aims to fill this lacuna and to propose a quantitative battery of scales for evaluating the impact of the program on its direct participants. The Scales were developed with the operating staff of "Learning about the past - a bridge to the present" program in Ein Dor Museum. The Presented scale examines four main Variables (Attitudes toward encounters; Expectations of encounters\ experience of the encounter; Perception of the other group; Overall assessment of the process). 2722 Questionnaires were collected through 2012-2017, the results show good Reliability and Content Validity. The presented scale possible contribution to accumulative knowledge on Jewish- Arab Encounters is discussed.

Key Words: Jewish Arab Encounters, Evaluation Research, Inter- Group Relations

INTRODUCTION

The literature suggests varied ways of reducing inter-group tension, including dialogue encounters between participants from different ethnic, racial, religious, and national groups. This type of encounter is perceived as particularly effective among teenagers, when the peer culture has a major role in shaping perceptions and attitudes towards the social world and makes it possible to embrace new behaviors relatively easily. In general, in present-day western societies, the teen age is considered a constitutive stage in the development of personal and social identities, a time when people are relatively open to educational influences and to reshaping their personal attitudes and world views. Hence, stereotypes and prejudices are more inclined to change and there is more chance of reducing intergroup conflict through dialogue encounters (Garvin & Bargal, 2008).

This is the reason that mixed encounters of teens from different groups are a common intervention strategy in projects aimed at reducing inter-group tension, particularly in countries characterized by conflict between groups of citizens who live side by side. When the two ethnic or national groups are widely estranged and distant, as in the case of Palestinians and Jews in Israel, this lends further credibility to the assumption that inter-group encounters and changing attitudes are less viable among adults and more among children and teens, leading to the tendency to prefer interventions at younger ages (Amir & Ben-Ari, 1987). Hence Israel, which has suffered from its very first days from a stubborn conflict between its Jewish and Palestinian citizens, is fertile ground for implementing teen encounters between the sides in the conflict and for evaluating their efficacy, according to their various features and variables.

Despite many years of experience in operating such projects and the evaluation studies conducted (eg. Maoz, 2011; Ron & Maoz, 2013; Yablon, 2010), no justified battery of scales with reasonable reliability and validity, which can advance the accumulated knowledge in this field, has been formed to date. The current study aims to fill this lacuna and to propose a quantitative battery of scales for evaluating the impact of the program on its direct participants.
The current study seeks to offer a battery of practice-based scales that relates to quantitative combined evaluation (outcome + result) of the direct participants.

In developing the tool, we sought to stress the following features:

Response burden (Rolstad, Adler & Ryden, 2011): The logic underlying this concept is that the more the questions burden the respondent cognitively, emotionally, and physically, we expect to receive less valid answers. The response burden is a complex concept that includes important variables such as the length of the questionnaire and its clarity. We endeavored to develop scales that would be as short as possible, spaced out on the page and that mainly use the Osgood scale (Friborg, Martinussen & Rosenvinge, 2006).

Multidimensional evaluation: We sought an evaluation battery that would fill several purposes versus several target populations (Mertenz, 2009) – information concerning the intervention outcomes for funding factors, program operators, and partners; information concerning the intervention process that can help the operating team increase the suitability of the interventions in real time; and analysis of the association between the process and the outcomes, which can help the program team improve the program over time.

Relevance for practice: A good evaluation study is one whose results the program team wants to know, feeling that they can learn from them. Most of the studies reviewed built their indices based on theoretical concepts, where it was necessary to bridge between ideas from the research literature and ideas stemming from the practice wisdom of the program facilitators (Bamberg, Rugh & Mabry, 2011). As we shall describe below, we developed the scales in a process that allowed the program facilitators considerable influence on the contents and on formulation of the items.

Validity and reliability: We were interested in scales for which evidence of their internal reliability and content validity is available.

METHOD

Respondents

The evaluation study included all participants in the museum's activities in this program from 2012 to 2017. This is a two-year program and questionnaires were administered at four points in time, at the beginning and end of the first year and at the beginning and end of the second year.
One of the fundamental decisions that confronted us was whether to mark the questionnaires in such a way that would make it possible to Identify and follow the four questionnaires of each participant. Methodologically this has many advantages – the ability to monitor results, the ability to identify new students and old students who had dropped out (even if such dropping out and joining was marginal). The big disadvantage of this identification concerned the anonymity of the

questionnaires – if a child knows that we will be able to recognize who was writing, even if it makes no sense that we would search specifically for him, when completing the questionnaire he might take into account that it will be possible to know what he wrote, and this might impair the validity of the questionnaires.

In a joint discussion with the program team we preferred complete anonymity over better ability to monitor the questionnaires, and therefore we did not mark them by respondents.
We can, however, present the main characteristics of the respondents.
In total, 2,722 questionnaires were collected over this period, with the following distribution:

Table 1. Number of Subjects in Each of the Four Measures

		Year in Program		
		First Year	Second Year	Total
Phase	Year Beginning	636	602	1238
	Year End	740	744	1484
Total		1376	1346	2722

Of the 2,722 questionnaires, 1,376 were from the first year of activity and 1,346 from the second year. There were 1,238 year-start questionnaires and 1,484 year-end questionnaires.
With regard to nationality, of the 2,722 respondents, 1,337 (49.2%) were Jewish and 1,383 (50.8%) Arab. In two questionnaires the respondents did not state their national affiliation.
With regard to gender, 1,236 (48.3%) were boys while 1.321 (51.7%) were girls. Interestingly, in 165 questionnaires (6.1%) the respondents chose to refrain from noting their gender group.
All participants were elementary school students in the 3rd-5th graded (aged 9-11), with 418 (15.1%) 3rd graders, 848 (33%) 4th graders, and 1,456 (56.9%) 5th graders.

The students came from eight elementary schools, four Arab and four Jewish, all in Northern Israel in the Jezreel Valley region. All the participants came from rural villages rather than residing in cities.

The questionnaires were administered in the first and last encounter of every year. Administration took ten minutes on average.

Scale development process

As this research aimed to develop scales that would be relevant to the perceptions, practices, and needs of the program staff, we initiated a mutual process which can be described as follows:
In the first phase, we had two 6 hours workshops:
The first workshop was intended to help staff members define and describe their internal work model: after a brief introduction, the members were divided into pairs. They were instructed to interview each other on their perceptions of the social reality in Israel; on how they define the goals of the encounter; and on the question of what would have to change in order to affect the desired goals. Each gave examples of concrete events that symbolize both positive and negative events. The interviewer summarized his learning in a pre-defined diary.

In the second part of the workshop, each member described his couple perception, and was asked about it by both the researcher and another staff member. This discussion was documented manually by an assistant.

Although the staff members knew the process was evaluation oriented, in this workshop we did not talk about evaluation at all.

This workshop and the diaries and summary were the basis for content analysis describing the main themes and ideas. This analysis was the basis for the second workshop.
The second workshop was opened by the researcher who shared the content analysis with the staff. Then each staff member was asked to think in terms of evaluation: what were the main variables that should be studied?

In the second part of the workshop, each member described his conclusions, and was asked about them by both the researcher and another staff member. This discussion was documented manually by an assistant.

The content analysis of the second workshop was the basis for building the current scale.
The researcher developed a first draft of the scale and passed it to all the staff members. The staff members were asked to review the scale with regard to two issues: staff members' view of the content of each item and view of the wording and its suitability for children.
After the staff's comments we sent a corrected version.

The next step was a pilot test with two groups of children attending the museum's program in order to learn about the scale's clarity from their perspective. This input indeed helped us change a few of the wordings.

INITIAL PRESENTATION OF THE BATTERY'S SCALES AND SUBSCALES

The first three scales were administered at all four points in time (beginning and end of the first and second years). The fourth scale was administered only at two points (end of first year and end of second year).

Scale on attitudes toward encounters

Three subscales: participant's attitudes; perceived perceptions of parents' attitudes; perceived perceptions of the peer group.

Expectations of encounters\ experience of the encounter

Four subscales: participant's expectations concerning the activities; participant's expectations concerning the program's staff; participant's expectations of other in-group participants; participant's expectations of out-group participants.

Scale on perception of the other group

One scale.

Overall assessment of the process (yearend only)

We measured the participants' overall assessment of the process using three questions:
The scales, scale reliability, and content validity will be discussed in the results section.

RESULTS

Scale on attitudes toward encounters

This 8 item Osgood scale measures the participant's attitudes toward the encounters (e.g., are the encounters important or unimportant; do teens participate because they want to or because they must, etc.). Four items measure the participant's personal attitudes toward the encounters, two items measure the participant's perception of his or her parents' attitudes toward the encounter, and two items measure the participant's perception of his friends' attitudes toward the encounter.
Cronbach's alpha for these 8 items was high (.93) as well as for the subscales: participant's personal attitudes toward the encounters (α = .94), participant's perception of his parents' attitudes toward the encounter (α = .95), and participant's perceptions of his partner's attitudes (α = .92)
To obtain a better understanding of the scale's structures, especially for the division between the subscales (self, parents, friends) we used a multi-dimensional scaling analysis (MDS)
The results of the MDS are shown in Figure 1.

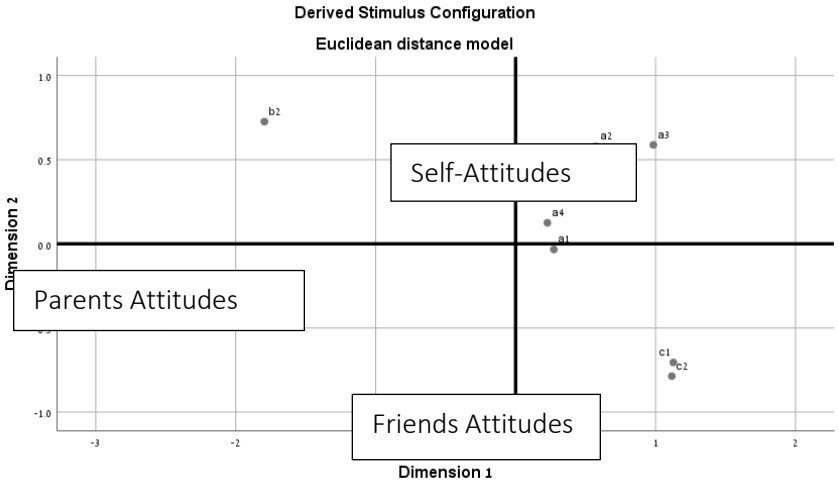


Figure 1. MDS map of Attitudes toward the Encounter Scale

The MDS analysis shows a clear division between the three subscales, with self-attitudes in the middle, parents' attitudes on the left, and friends' attitudes on the right.
Table 2 shows means and standard deviation for the three subscales.

Table 2. Means and Standard Deviations for the Subscales of Attitudes toward Encounter

Descriptive Statistics

	N	Mean	Std. Deviation
Self Attitudes	2635	3.2425	1.52333
Parents Attitudes	2621	3.4126	1.68242
Peer Attitudes	2648	3.1341	1.53155
Valid N (listwise)	2561		

As can be seen in Table 1, the participants' perception of their parents' attitudes toward the encounter (M=3.45; SD= 1.95) seems to be more positive than their own perception (M=3.24; SD=1.53), with the participants' perception of friends' attitudes being the lowest (M=3.13; SD= 1.53).

Exploring these three variables reveals that all three of them have a u-shaped distribution.
These u-shaped distributions might reflect the polarity of the conflict between as well as within the two groups: Jews vs. Palestinians, right wing hawks vs. left wing doves, segregationist vs. integrationist perspectives - all lead to a polarizing discourse in which the students live and develop their perspectives.

These distributions are of high importance with regard for statistical analyses to be used, as they compel us to abandon parametric tests (e.g., t-test, Pearson correlations, ANOVA, linear regressions, etc.).

Expectations from the encounters

This 12 item 5 point Osgood scale measures the participants' expectations of the encounter in four major areas: the participant's expectations concerning the activities (3 items, e.g., interesting vs. boring), expectations concerning the program's staff (2 items, e.g., nice vs. unpleasant); expectations of other in-group participants (3 items, e.g., relaxed vs. tense); and expectations of out-group participants (4 items, e.g., safe vs fearful).

Cronbach's alpha for these 12 items was high (.94) as well as for the subscales of expectations concerning the activities (α = .93); expectations concerning the program's staff (α = .90); expectations of other in-group participants (α = .77); and expectations of out-group participants (α = .91).

To obtain a better understanding of the scale structure, especially for the division between the subscales (activities; program staff, in-group participants, out-group participants), we used an MDS analysis.

The results of the MDS are shown in Figure 5.

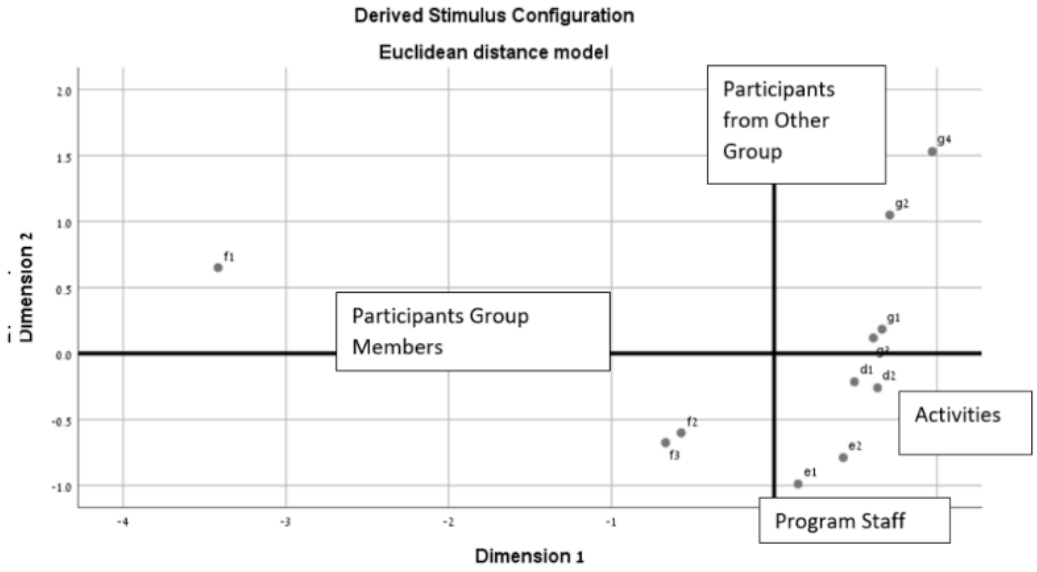


Figure 5: MDS map of Expectations from the Encounter Scale

The MDS analysis shows a clear division between the four subscales, with the participants' expectations of activities and of the staff occupying the middle of the map, participants' expectations of participants from their own group on the left, and those of the other group on the right. Table 3 shows means and standard deviations for the 4 subscales:

Table 3. Means and Standard Deviations for the Subscales of Expectations from Encounter

Descriptive Statistics

	N	Mean	Std. Deviation
Activities	2655	3.2627	1.57965
Program Staff	2651	3.4163	1.57533
Students In Group	2644	3.3649	1.39422
Students Out Group	2528	3.2176	1.40380
Valid N (listwise)	2473		

As can be seen in Table 3, participants' most positive expectation concerns the program's staff (M=3.54; SD= 1.53) and participants in the in-group (M=3.51; SD= 1.21), followed by participants' expectations of the encounter with participants from the other group (M=3.39; SD= 1.33) and program activities, of which the expectations were lower (M=3.26; SD= 1.57). Distributions for the four subscales were found to be u-shaped, as for the above variables.

Using MDS to learn about the intragroup process

Since in the current study we have four measuring points (beginning of project; end of first year; beginning of second year; end of project) accordingly, we conducted four MDS analyses for the following eight variables: the average of three subscales of Scale on attitudes toward encounters: participant's attitudes; perceived perceptions of parents' attitudes; perceived perceptions of the peer group. The average of the four subscales of Expectations of encounters\ experience of the encounter: participant's expectations concerning the activities; participant's expectations concerning the program's staff; participant's expectations of other in-group participants; participant's expectations of out-group participants. And the average of the Scale on perception of the other group. In order to analyze the MDS maps, we grouped the 8 variables into three facets:

The goal variables (Red): variables the program wishes to influence; Perception of the other; Experience of Outgroup; Participants attitudes toward Encounters.
The situational variables (Green): participant's experience concerning the activities; participant's experience concerning the program's staff.
In-group affect variables (purple): perceived perceptions of parents' attitudes; perceived perceptions of the peer group; Experience concerning the in- group.

The four MDS maps are presented in figures 6-9 below:

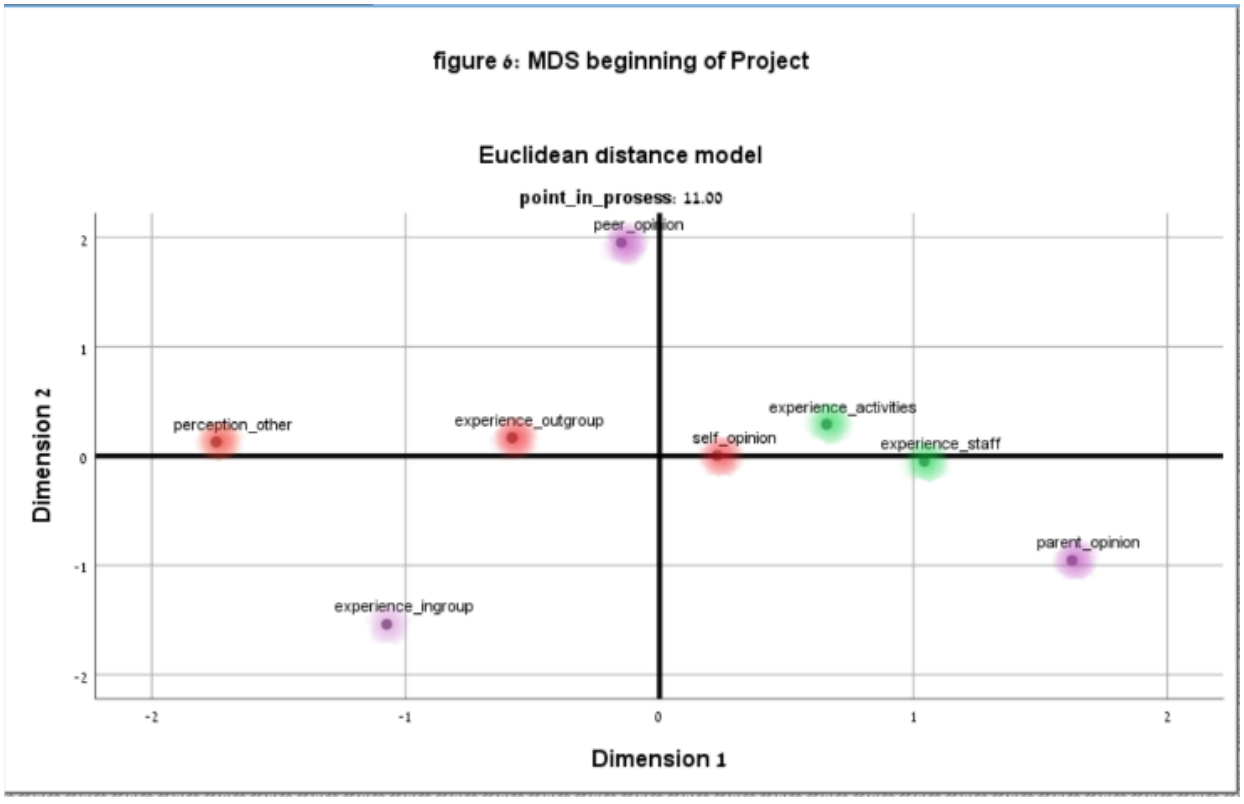


Figure 7: Mds at the end of first Year

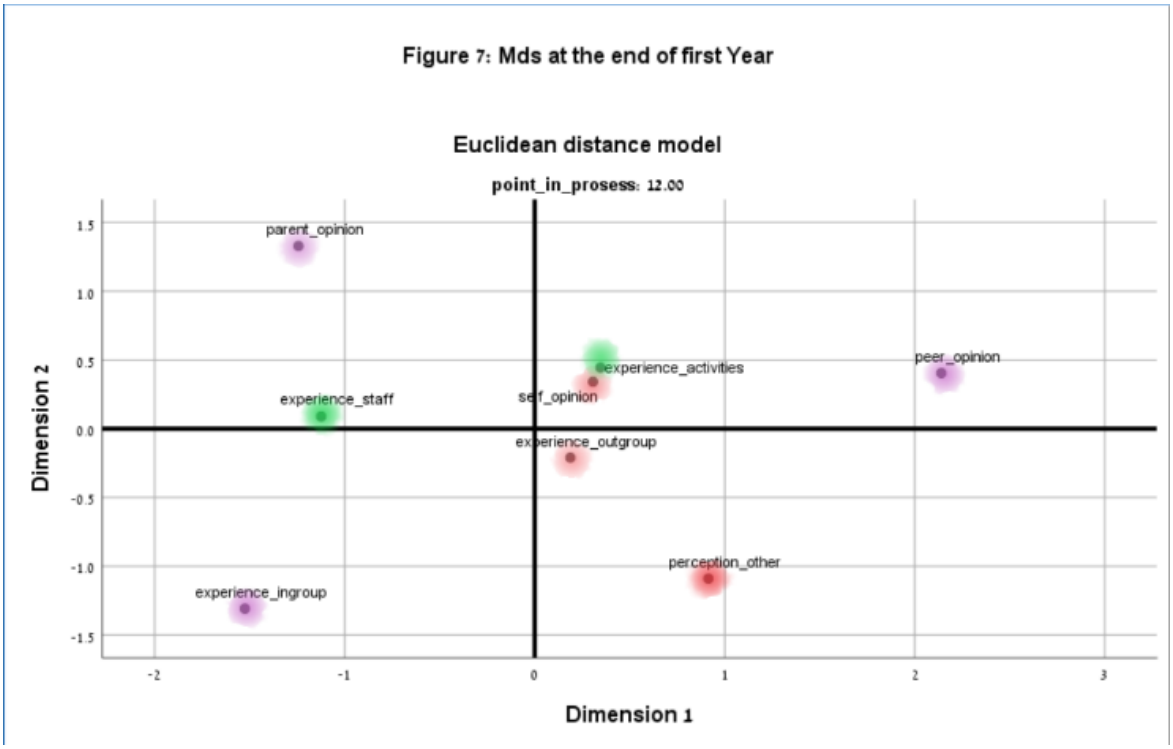
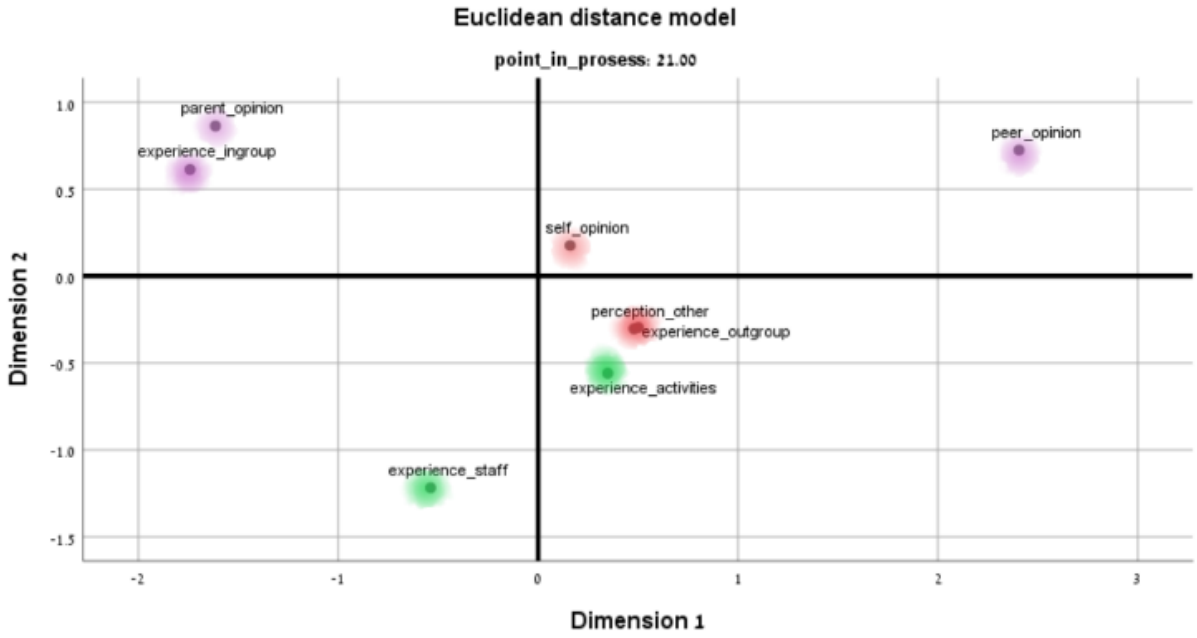
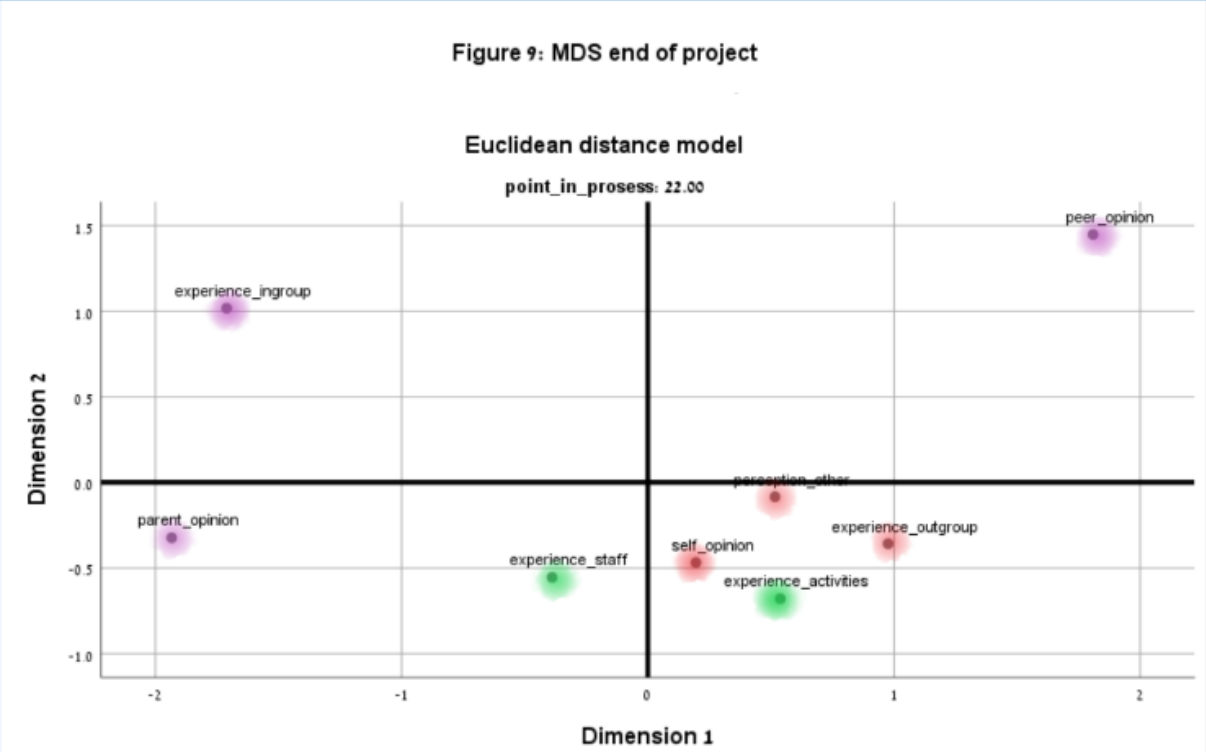


Figure 8: MDS at the beginnig of second Year





A look at the four diagram shows us a gradual process in which the goal variables are slowly changing from closeness to the In-group Effect Variables to closeness to Situational Variables: In figure 6, the perception of other is located far from the situational factors and between the in-group effect variables, namely, Perception of peer opinion and the participants experience of his in-group participants. The finding suggests that the participants contact with the other group is mediated by his perceptions of in-group attitudes.

In figure 7, both the experience of outgroup and the perception of the other move closer to situational variables, mainly the experience of activities. In this phase, the in-group effect variables still closely located near the goal variables. In figure 8, we can see that the goal variables are closely related to the situational variables, with in-group effect variables further moving to the periphery. In figure 9, we can see the same, with experience of staff component of the situational variables moving much closer to the goal variables.

DISCUSSION

The current study sought to propose a battery of scales for evaluating Jewish-Arab encounters from the perspective of the direct participants. The scales were constructed in a joint process with the staff of the program under evaluation. The research tool contained four scales: Views of the encounter (as perceived by the participant, the participant's friends, and the participant's parents), experience of the encounter (activities, facilitators, students from my school, and students from the other school), perceptions towards members of the other group, and overall evaluation of the process on the personal and group level. The findings show that the research tool has high internal reliability and satisfactory content validity.

MDS analyses at of those variables at four points during the intervention were used in order to learn about the intervention process. Taken together, these four MDS analyses shades important light on the process that participants experienced: moving through the perceived attitudes of the in-group, to allowing yourself to experience the activities and through them the members of the outgroup, to changing perception regarding outgroup and more fully experience the staff members.

The study contributes Accumulated knowledge on encounters affects and dynamics – Creating accumulated knowledge is one important goal of scientific investigation (Richardson, 2017; Freese, 1972), but when every evaluation study uses different tools it is hard for the knowledge to accumulate and be collected. Use of the proposed battery of tools can help us compare the findings of the various programs and start forming deeper insights of the effects of these programs as well as of more accurate ways of carrying out those processes.

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THEORIZING THE MEANING OF INCLUSION IN THE WORKPLACE FROM THE FACET THEORY PERSPECTIVE

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ABSTRACT

Although the concept of inclusion in the workplace has been attracting greater interest recently, it is a relatively new concept in the organizational literature and is still in its infancy. As a result, there is a lack of consensus regarding appropriate theoretical conceptualization of inclusion as well as its proper measurement. A systematic review revealed that the phenomenon of inclusion is a complex and multifaceted construct. However, little research has addressed a broad discussion on the concept of inclusion itself. We thus have insufficient knowledge of its constituent elements. Accordingly, the aim of this study is to propose a conceptual framework for inclusion in the workplace setting, in light of the metatheory approach of facets. We further seek empirical evidence to validate the proposal of facets, their elements and the internal structure of the inclusion concept. We have applied the facet theory as a whole, from de conceptualization of inclusion to development of scale and analysis, using Smallest Space Analysis. This wholeness is an innovative aspect that transcends other studies in this theme, theoretically as well as empirically. The sample of this study consists of 145 white-collar employees by car industry in the state of Sao Paulo, Brazil. Our findings support a multifaceted concept of inclusion comprised by three facets: AGENT (peer and superior), ACTION (permission, recognition, and support), and EFFECTS (belongingness, uniqueness, and respect). These results make an important theoretical contribution to the advancement of the literature on inclusion, and practical implication, as well.

Keywords: Inclusion; Facet Theory; Inclusion Measurement.

INTRODUCTION

The concept of inclusion has been attracting greater interest recently, but it is still in the early stages of development (Roberson, 2006). Moreover, there is a lack of consensus regarding its appropriate theoretical conceptualization (Shore, Randel, Chung, Dean, Ehrhart & Singh, 2011) as well as the proper measurement of the concept (Jansen, Otten, van der Zee, & Jans, 2014). Despite the growth of research on inclusion in recent years, a systematic review conducted by Queiroz & Hanashiro (2016) in management and social psychology academic journals revealed that the phenomenon of inclusion in the organizational setting is a complex and multifaceted construct. In light of the current literature, we argue the need to integrate and systematize the theoretical and empirical knowledge concerning inclusion developed over the last few decades, moving towards a theorization of the inclusion concept. Thus, the objective of this study is to propose a conceptual framework for inclusion in the workplace setting, via the metatheory approach of facets. We chose a metatheory approach to aggregate the multiple elements of inclusion into a multifaceted conceptual model. The metatheory approach used as orientation in this research was facet theory (FT) since this approach provides a metatheory framework for conceptualizing the relationships between complex system components and advancement in theoretical development (Hornik,

Cohen & Amar, 2007). Supported by a systematic literature review and in the light of facet theory, we propose a multifaceted conceptual model that integrates existing literature perspectives and comprises three facets of inclusion: AGENT (peer and superior), ACTION (permission, recognition, and support), and EFFECTS (belongingness, uniqueness, and respect).

PERCEPTION OF WORKPLACE INCLUSION

The concept of inclusion has been attracting greater interest recently, but it is still in the early stages of development, as highlighted by Roberson (2006). Moreover, there is a lack of consensus regarding its appropriate theoretical conceptualization (Shore, Randel, Chung, Dean, Ehrhart & Singh, 2011). To pursue an inclusion concept, we performed a literature systematic analysis following the procedures of Podsakoff et al. (2016) and by theoretical methodological lens FT that substantiated our conceptual proposal. As systematic review results, we identified comon elements of perception of inclusion construct at academic literature. First, the inclusion process starts with various AGENTS within the organizational scenario and identified in management literature. The agent's roles in creating an inclusive environment is an important factor that influences the individual experiences of inclusion (Hanashiro, 2016). Another common aspect is related to the agents ACTIONS during the inclusion process. Inclusive behavior was regarded as the "actions or practices, both on the part of individuals as well as other members of the workgroup, that are distinct from but thought to be likely to lead to experiences of inclusion" (Ferdman et al., 2009: 7). Mor Bark's inclusion concept refers to actions that is perceived by employees "… individual sense of being a part of the organizational system in both the formal processes, such as the access to information and decision-making channels, and the informal processes, such as *water cooler* and lunch meetings where information and decisions informally take place" (Mor Barak, 2013:155).

The third element is EFFECTS feel by individuals. Employees who experience inclusiveness come to have positive feelings, such as valued, respected, accepted, authentic, and supported (Hanashiro, 2016). Shore et al. (2011) define "inclusion as the degree to which an employee perceives that he or she is an esteemed member of the work group through experiencing treatment that satisfies his or her needs for belongingness and uniqueness" (Shore et al., 2011: 1265). Based on the literature review, We propose a conceptual model: Inclusion is a process that involves an agent, who performs one or more actions, and the receiver, usually the individual who perceives the actions and feel its effects. And then we will address the theoretical basis that underpins the facets and their structural suppositions.

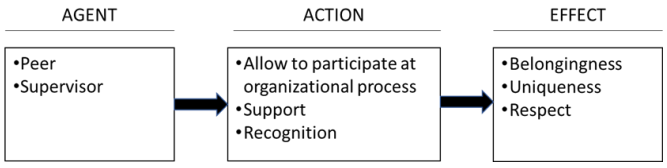

Figure 1: Conceptual Model: ACTION-EFFECT Role

AGENT

Mor Barak (2013) developed an escale to measure inclusion by perception of the actions carried out by superiors, peers and by the organization. In social support literature, Barrera (1986) identifies peers, supervisors, family, and friends as the source of perceived support. Peers and leaders are singled out as the main sources of respect for individuals in the workplace (Huo & Binning, 2008; Rogers & Ashforth, 2017). In short, the elements of the AGENT facet identified are: Employee, Peers, Superiors, Subordinates and the Organization. For this research, two agents were considered - Peers and Superiors.

Structural Hypothesis 1: Peers and Superior are elements of the AGENT facet and have an axial configuration.

Action

The second facet identified in inclusion literature is the ACTION performed by the agents, regardless of the employee's initiative. The facet elements are kinds of actions that range from the permission to participate in organizational processes to recognizing and valuing employees' ideas and suggestions. We propose three key actions: Permission, Recognition, and Support.

Permission- Inclusion refers to the individual's feeling of being part of formal and informal organizational processes (Mor Barak, 2013). The employee, when invited to participate in decision-making channels and have access to work-related information, feels like a member of the group and therefore included (Pelled et al., 1999; Roberson, 2006). Participation encompasses mechanisms used to involve employees in decisions at all levels of the organization (Marchington & Wilkinson, 2005). **Recognition -**Recognition at work is associated with expectancies of retribution received from the organization, and with the importance of the other in establishing judgments about the value of the individual and their work (Bendassolli, 2012). Recognition consists of a judgment about personal contribution to the organization, in terms of work practices, results and dedication (Brun & Dugas, 2005, 2008). Upon recognition, the employee becomes entitled to express his or her opinion and influence the decision-making process. Cccording to Mendes and Tamayo (2001), he or she has the freedom to express his or her individuality. **Support-** Leaders' support becomes particularly important for employees to feel included in the work environment (Shore et al., 2011). Social support in the work environment is the degree to which the individual perceives that his or her well-being at work is valued by superiors, peers, and the organization through positive social interaction and available resources (Kossek, Pichler, Bodner, & Hammer, 2011). Based on the current literature we propose the following structural hypothesis:

Structural Hypothesis 2. Permission to participate in formal and informal organizational process, recognition and support are elements of ACTION and have a polar configuration

Effects

We argue that the employee experiences in the organization, from the perception of the actions of the different agents, result in a set of individual effects, thereby completing the inclusion dynamics

proposed in this work. This experience is pointed out by Ferdman (2014) as the foundation of inclusion. Employees who experience inclusiveness come to have positive feelings, such as valued, respected, accepted, authentic, and supported (Hanashiro, 2016).

Belonginess- The importance of belonging has been addressed in the psychology literature for many years. Belonging to a social group is a fundamental and universal human need (Brewer, 1991). According to Baumeister and Leary (1995), all people have the need to form and maintain a minimum number of interpersonal relationships with other people. **Uniqueness-** The benefits of the employee's contribution to what is unique and differentiated are one of the main arguments used in diversity and inclusion studies. Uniqueness is the component that "distinguishes the individual from any other person in the social context" (Brewer, 1991: 477). The distinction between a person and other members is performed by the group or group members, who value the unique characteristics of the individual (Shore et al., 2011).The fundamental human need for differentiation has a relevant role in the construction of the individual's social identity (Brewer, 1991). To meet this need, the individual needs to be differentiated from others (Snyder & Fromkin, 1977), and differentiation occurs when talents, ability and ways of living are valued and leveraged (Ferdman, 2014). **Respect-** A person experiences inclusion when other individuals practice appropriate behaviors and show respect for them (Ferdman, 2009: 2014). Thus, when feeling included the individual feels valued by the group and increases his or her intention to invest in the group (Ellemers, Sleebos, Stam, & de Gilder, 2013). Employees report respect when leaders and peers "demonstrate confidence, confer responsibility, reward performance, and seek information for decisions" (Rogers & Ashforth, 2017 :1592).

Structural Hypothesis 3. Belongingness, Uniqueness, and Respect are elements of EFFECT facet and have a modular configuration

We propose an EFFECT structural hypothesis with belongingness element in the center, respect in the middle layer and Uniqueness in the peripheral layer. Our argument for this configuration is based on Brewer's optimal distinctiveness theory and Maslow's theory of human motivation.

According the Facet Theory researchers, we develop a mapping sentence that summarizes the facets, their elements, and the range of measurement.

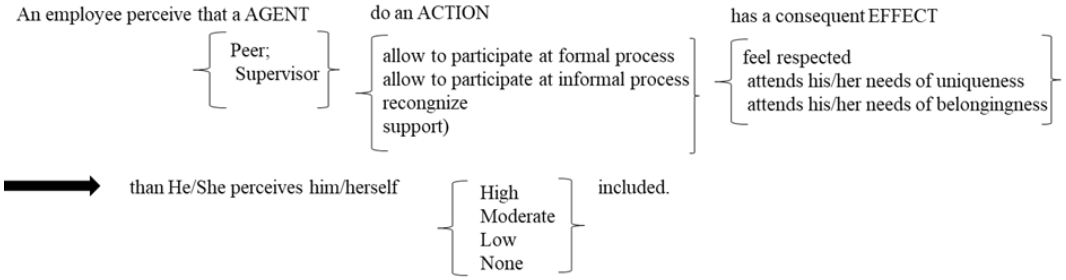

Figure 2: Mapping sentence for Inclusion

METHOD

We investigated a total of 145 professionals from automobile manufacturers and suppliers from different Brazilian cities, mostly from Sao Paulo metropolitan area. Among the participants, 80% were men, and 79% were white, 11% mulatto, 11% indigenous people, and 8% Asian descendant. Our sample was relatively well educated, with 45% of participants having a graduate education (Specialization courses, and master's degree in business administration) while 42% have completed the university, 7% with master's and a Ph.D., and 6% had not completed their university course. The age of respondents was divided into three categories, ranging from 26 to 30 years (31%), 41 to 45 (21%), and 46 to 50 years (20%). Most participants (97%) are white-collar employees such as in engineering, marketing, sales, finance, HR and administration.

We developed the questionnaire according to FT, based on some scales validated in the literature and adequately adjusted to the facets approach. Our structuring sentence has three facets (AGENT-ACTION-EFFECT) with their respective elements, resulting in 24 structuples (2 x 4 x 3). The initial questionnaire contained 42 items, as some structuples had more than one item.
ACTION – Permission to participate in formal and informal organization processes: Inclusion - Exclusion Scale (Mor Barak, 2013).
ACTION – Recognition: Mendes Scale (Pereira, 2003)
ACTION – Support: Social Support Scale (Caplan, Cobb, French Jr, Harrison, & Pinneau Jr, 1975)
EFFECT - Belongingness: Need to Belong Scale (Leary, Kelly, Cottrell, & Schreindorfer, 2013), adjusted and validated by Gastal & Pilati, (2016) to the Brazilian context.
EFFECT - Uniqueness: Snyder & Fromkin Scale (Snyder & Fromkin, 1977).
EFFECT – Respect: Ellemers et al. Scale (2013).

We carried out the first pretest in order to limit common method bias and assure that respondents clearly understood every sentence, identify ambiguous items and reduce social desirability (Podsakoff, Mackenzie, & Podsakoff, 2010). A sample of two university students and four employees of an automotive company answered the survey, and a further discussion meeting has carried out. After this step, we conducted a second pretest with 93 university postgraduate students (58 women and 35 men) who answered the 42-item questionnaire printed version, in an anonymous method. Reliability analysis of the total scale showed a good result of Cronbach's coefficient (alpha= 0.88). For the final sample, we developed an online version with minor adaptations to reduce the answering time and achieve more potential respondents. The final questionnaire with 39 items integrating the three facets like "my superior, recognizing my performance, makes me feel an accepted member in the workgroup" (superior- recognition-belongingness); "my co-worker, by helping me in difficult times, makes me feel respected" (peer-support-respect)., showed better reliability (alpha = 0.93). All the items were assessed with a five-point scale from 1 (Strongly Disagree) to 5 (Strongly Agree).

RESULTS

To define regions of each element, We draw partition lines in SSA space that may be lines or curves separating the points as suggested by Borg, Groenen, and Mair, (2013). To test the hypotheses a three-dimensional solution of SSA was used and the coefficient of alienation for this solution Stress-1 = 0.169, indicates an acceptable solution according to (Bilsky, 2003; Souza,

Wanderley, Souza, & Roazzi, 2016). Figure 3 shows the SSA diagram for AGENT facet with curves separating Peer and Supervisor regions. We observed that this configuration is consistent with the structural hypothesis proposed, that employees perceived differences between peers and supervisor inclusive attitudes.

ACTION Facet- The SSA diagram confirms structural hypothesis as a polar pattern. The elements, support, recognition and permission to participate in the organizational process, were distributed in three distinct regions in cartesian space. The result indicates no distinction between formal process and informal process.

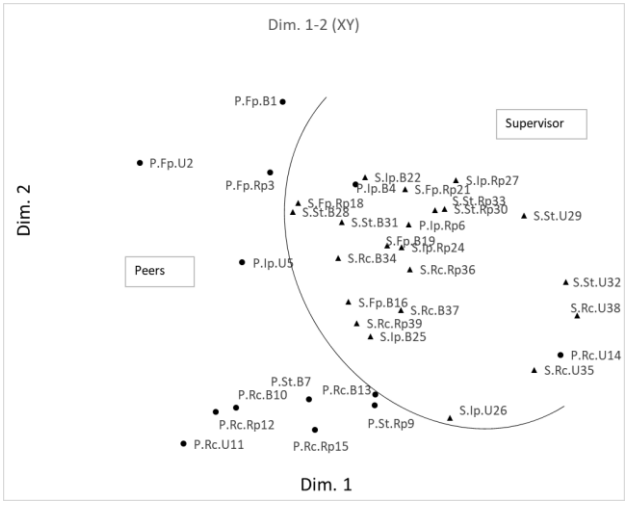

Figure 3: MDS Representation for the AGENT Item

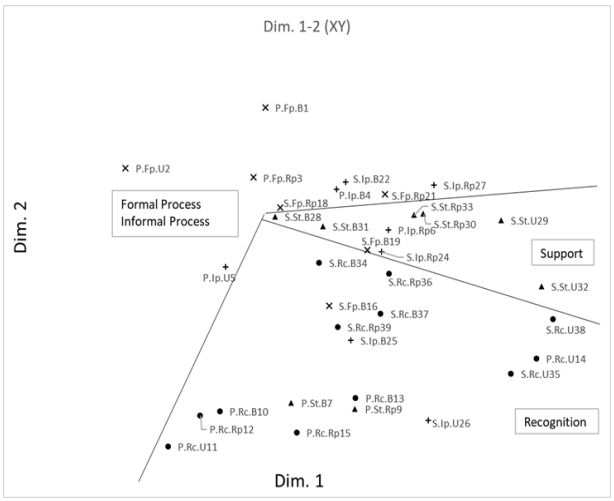

Figure 4: MDS Representation for the ACTION Items

EFFECT Facet -The SSA diagram confirms the structural hypothesis in a modular pattern, with Belongingness at the inner circle, Uniqueness at peripheral region and Respect between them. We can note that item 1, 5, 10, 18 and 39 appears to be misplaced. The structuple Peer-Formal process-Belonginess (item 1) and Peer-Recognition-Belonginess (Item 10) have a low correlation with other Belongingness items. In addition, the structuple Supervisor-Formal process- Respect (item 18) and Supervisor-Recognition-Respect (item 39) have high correlation with belongingness items.

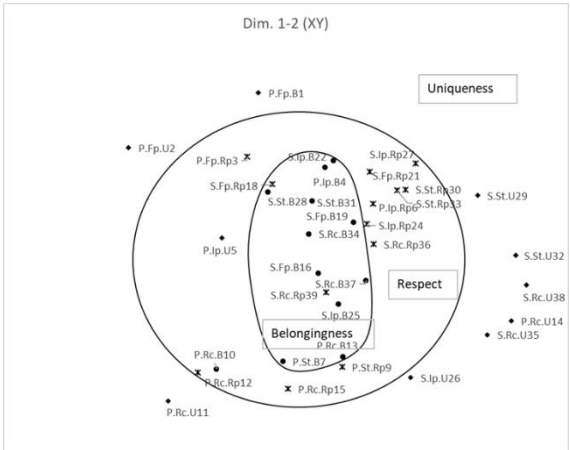

Figure 5: MDS Representation for the EFFECT Items

DISCUSSION

The systematic literature review process, based on the procedure recommended by Podsakoff et al. (2016) allowed us to infer the facets AGENT, ACTION and EFFECT. This procedure associated with the metatheoretical approach of the facets, supported the organization and structuring of the concept, the generation of questionnaire items and data analysis. Empirical results and multidimensional analysis support the existence of the facets identified in the literature review.

In the MDS space of the AGENT facet, it was possible to distinguish two regions, relative to Peer and Supervisor, yielding an axial structure. The data confirm that both the peers and superiors influence the inclusion of employees but in a different way. These results corroborate the statements of Mor Barak (2013), Ferdman (2014) and Shore et al. (2011), who pointed out the presence of peers and superiors in the perception of inclusion. The separation in regions shows that the perception of the individuals concerning superiors and peers is different. Support from superiors has a more significant influence on the reduction of intention to leave and stress than the support given by peers (Nissly, Mor Barak, & Levyn, 2005). In short, the results confirm the presence of the AGENT facet with the Peers and Superior elements, but a possible ordering between Peers and Superiors was not proven.

In the multidimensional analysis related to the ACTION facet, we observed regions defined between the elements Recognize, Support, and permission to participate in the processes. The partition of space in the polar form, predicted in the structural hypothesis of the ACTION facet, was confirmed. The variables of both elements the permission to participate in the Formal and Informal Processes formed a region in the two-dimensional plane. It is important to highlight that we based our consideration of these two processes on Mor Barak et al.'s (2013) theoretical proposal. However, this scale does not predict the separation between the two dimensions, but only presents items that measure participation in formal and informal processes. Previous studies using the Mor Barak scale did not conduct analyzes of the formal and informal dimensions (Cho & Mor Barak, 2008). The variables of the Support element are correlated with each other and form a region in the two-dimensional plane. The support action is identified in the Jansen et al.'s (2014) research as an aspect of the perception of belonging. In the structural hypothesis, we proposed that the Support element would be in opposition to the participation in the formal processes of the organization. We understand that support, such as assistance to people (Barrera, 1986) is present in the informality of the workplace and is less likely to be a formal practice foreseen in organizational processes. The empirical results of multidimensional scaling support the structural hypothesis in which the support element is closer to informal participation than to formal participation. The importance of support is demonstrated by Findler, Wind and Mor Barak (2007) in a survey in which employees who reported receiving greater support expressed a higher sense of inclusion.The variables of the Recognize element are correlated to each other, forming a region in the two-dimensional space. The findings of this research that Recognition is part of the inclusion construct finds support only in essays that defend the importance of recognizing the differences (Ferdman, 2014; Mor Barak, 2013).

In the multidimensional analysis of the facet EFFECT, the Uniqueness, Respect, and Belongingness elements appear in distinct regions. The space partition in the modular form

predicted in our structural hypothesis of the facet EFFECT was confirmed. Uniqueness and Belongingness are components in the inclusion concept of Shore et al. (2011), and they are present in the different conceptualizations of the construct. One contribution of the present research is to consider the feeling of respect as one of the effects of the agents' actions. Employees, when perceiving the actions to include them, feel respected by their superiors and peers. According to Rogers and Ashforth (2017), the sense of respect is perceived by employees when leaders demonstrate trust, responsibility, recognize results, and seek information for a decision. The results of this research evidenced the presence of the Respect element in the facet EFFECT, along with the elements belongingness and uniqueness.

The hypothesis of hierarchy among the elements of the facet EFFECT was confirmed. The Uniqueness element was positioned in the outer circle, whereas the Belongingness element in the inner circle. In Donald's (1985) research, the element located in the center represents the most central or essential aspect of the facet. This interesting finding reveals that the need for belonging has more influence on the perception of inclusion of the individual, but this fact does not exclude the need to Uniqueness and feel respected. The centrality of the element belongingness in the facet EFFECT presents support in the literature of social psychology. The theory of social identity postulates that the individual classifies into one or more categories, and identifies with in-group members, in the process of social comparison, generating the perception of belonging to the group (Ashforth & Mael, 1989). By achieving high levels of similarity to the other members of the in-group, the individual's need to differentiate is activated (Snyder & Fromkin, 1980).We based on the theory of human needs to support our proposition that the need for respect lies in an intermediate circle between belongingness and uniqueness (Maslow, 2012, 2014). Throughout Maslow's works, respect is presented as an element of self-esteem. According to Rogers and Ashforth (2017), the need for self-esteem is occasionally referred to as self-respect and is related to the sense of belongingness. In Maslow's (2014) hierarchy of human needs, after satisfying the need for self-esteem, the need for self-actualization emerges in the individual. Maslow (2012) argues that the self-actualized individual is defined as authentic, genuine, seeking self-expression and his "individual differences are high" (Maslow, 1954: 22). In this sense, the need for self-actualization is related to the need for uniqueness. Some empirical findings in the inclusion literature strengthen the configuration of the EFFECT facet obtained in this research. Ellemers et al., (2013), found a positive and statistically significant relationship between respect and perception of inclusion.

CONCLUSION

The results of this research proved empirically that three interrelated facets compound the inclusion construct. Workplace inclusion is the employee's perception of actions (recognize, support, and allow participation in formal and informal processes) practiced by agents (superior or peer), which generate an effect (sense of belonging, respect, and distinction) on employees. In the current paper, we provide three main contributions. First, we develop a new concept and measurement of inclusion, by integrating the existing concept of the literature. Our research suggests that a relationship exists among the inclusion facet, AGENT-ACTION-EFFECT. As a second contribution of this study, we have provided empirical support to the theoretical assumption that inclusion is a multifaceted construct, advancing the approaches of Ferdman et al. (2009), Mor Barak (2013) and Shore et al. (2011). By focusing on the development of a measure based on the full application of facet theory, we also contribute to a new tool for inclusion diagnosis in the

organizational context. Third, the article advances the literature proving the relationship between the elements of a facet, such as, the relationship between recognition and respect is verified when the individual perceives that he or she is recognized for his or her contribution, which in turn generates a feeling of respect as a professional.

There are limitations that should be recognized. First, the sample of 145 employees of the automobile industry was obtained by the criterion of accessibility. Second, although we have carried out a systematic review of the literature, it reflects articles published in the English language, which represents the mainstream of inclusion literature. Future studies would benefit by extending the research to different economic sectors, types of organizations in various countries in order to deepen the validation of inclusion scale in other contexts.

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ENVIRONMENT INDICATORS FOR RIVER RESTORATION: A FACET APPROACH TO REVEAL THE INTERPLAY OF ENVIRONMENTAL, SPATIAL AND SOCIAL DIMENSIONS

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ABSTRACT

This article aims to reveal the interplay of environmental, spatial and social dimensions focused on the restoration of Brazilian urban rivers. Urban occupation and environmental preservation clash is recurrent in large urban centers and it has reached medium and small cities, while a paradigm shift in response to better interventions in urban rivers is urgent. Thus, the goal of this article is to contextualize river degradation in Brazilian cities and holistically assess urban occupation conditions and their impacts based on systemic thinking concept. Facet Theory was applied to elaborate a questionnaire and statistical system of Smallest Structure Analysis to analyze data from 35 specialists in urban water. It allowed the comprehension of urban occupation evaluations and its effects on the river environment. The results are discussed in the light of the literature presented, as well as discussed potentials and limits of an increasingly consistent system of indicators.

INTRODUCTION

Water is an essential element of life and its quality reflects the population life quality, as well as the conditions of urban spaces. The history of many cities is linked to the presence of water bodies, over the years rivers have performed several functions that favored cities development like food production, consumption, energy, mining, transportation, commercial products, territory boundaries and even dumping of all kinds of human waste. In addition to these aspects and as a cognitive element, socio-cultural values as aesthetic, emotional and religious meanings are attributed to rivers landscape due to their shape, colors, movements smells and sounds. In Brazil, these conditions also contributed to the emergence and growth of cities along watercourses.
The accelerated urbanization process that occurred in Brazil during the mid-twentieth century changed how water is managed in urban spaces, although not to improve it. The demand for health and epidemics control in cities achieved such a complexity that urban strategies became dominated by hygienist vision which tried to offer, out of syncs, infrastructure to a rapidly growing population. This situation directly influenced the increase of multiple water uses, mainly the so-called consumptive uses which means one that causes losses between derived volume and volume that returns to the watercourse.

Recently, researches have dealt with the definition of evaluation systems for urban water conditions, mostly based on a holistic view about the urban space. They focus on create tools and methodological strategies that can measure the possibility of river restoration conditions. Indicator systems tend to wed theory and practice from different disciplines, such as biology, architecture, urban planning, geography, art, history, climatology and other environmental disciplines. Restoration consists of improving river functions and restoring dynamic balance of its surronds. It

must involve the urban, social, environmental and economic specificities of the intervention area to guarantee the sustainability of the ecosystems involved.

Indicator systems are applied in qualitative and quantitative assessments of a given ecosystem conditions. Its methodological approach is to simplify information about complex phenomena into qualitative or quantitative data and evaluate them according to an abstract conceptual basis. Indicators can have one or more variables, as long as their logical structure reflects the functioning of the system itself, which can be social, environmental or economical risks or potentialities.
The literature points out that since the 1960s a set of indicator systems have had a greater development in the environmental realm. Nowadays, it presents itself as an useful tool for studies of urban watersheds conditions. Efforts on indicator systems application can guide stakeholders, urban designers, and the common population for more appropriate choices when considering intervention projects in urban rivers. It can also highlight the existing conditions as a powerful environmental education tool for the common population. It is foreseen as something necessary for the construction of public policies on the Agenda 21, the New Urban Agenda - NAU (UN-HABITAT) and the UN Sustainable Development Goals. The last one establishes the goal 6th, "Clean Water and Sanitation" and encourages the use of water systems indicators in urban rivers to monitor their conditions. Therefore, indicator systems and its applicabilities prove to be an opportunity to be explored.

Tucci (2008) states that interventions in Brazil watercourses are still based on a hygienist view of fast flow. Those are interventions that tend to prioritize economic bias (costs of implementation and materials used) and quick responses to the existing problem. However, socio-environmental problems, such as floods, sediment dragging and waterborne diseases increasingly worsening in Brazilian cities, urging for a systemic approach involving morphological, environmental, social and economic aspects to collaborate with better long-term solutions.

Bearing in mind all mentioned above, this research questions are: how are the elements of urban occupation articulated to cause urban rivers damage? What concepts and criteria should be established to assess the existing conditions of urban occupation that can recommend intervention guidelines focusing on the urban river's restoration?

Thus, this research aims to correlate the main aspects of urban occupation that contribute to the degradation of urban rivers and that can be used as a criteria for evaluating the conditions of conservation and restoration of these rivers. Given the theme complexity and the demand of an interdisciplinary and transdisciplinary articulation, this investigation is based on empirical research carried out with experts to identify the structures and correlations between the causes of urban occupation and its effects on urban rivers.

Understanding the urbanization process from waters courses perspectives is essential to comprehend the processes that led to rivers degradation in Brazilian cities. Stream rectification and rapid rainwater drainage are still adopted as solutions to control floods as regard water solutions in urban spaces. However, the literature points out that since the beginning of the twentieth century, discussions about rainwater segregation from the sewer, as well as the use of green masses in gardens, flowerbeds and squares took place among import professionals of that period, although mostly done for city beautification and corridors ventilation.

Water issues acquired greater complexity in the Brazilian urban space with the intense urbanization process in the country, especially during the modernization and industrialization of cities, when the demands for health and control of epidemics were dominated by hygienist strategies. The logic of the rapid flow of urban waters took over the solutions used in several cities, often transforming urban rivers into central sewage collectors. It is a point in Brazils history that marks a rupture between river and urban environment.

Tucci (2008) describes that the hygienist phase is the one in which the transport of effluvium predominates to places that are distant from the population, and in which there is a great use of canalization and drainage of water. These actions took place worldwide until the 1970s, which aimed at reducing disease, flood control and creating transport routes. By the end of the 70s and the advent of environmental issues, some economically developed countries changed the hygienist approach to focus on the treatment of domestic and industrial sewage, dumping of runoff, as well as, treatment of rain runoff. Strategies, tools, and policies aimed at restoring urban rivers as well as environmental conservation took place in these countries, as a result of all of that can be seen as flood reduction, clean water, and improvement of life quality.
Furthermore, the discharge of sewage into river systems contributes to the devaluation of riverside landscapes and transforms them into residual elements in the urban fabric. The presence of bad smell, water turbidity and contamination possibility added to the threat of flooding and the perception of the river as an obstacle to mobility are constant factors that contribute to cultural depreciation values linked to rivers images. They often lead to loss of affectivity and forgetfulness of water resources in cities.

Water resources degradation can be classified into two types: direct and indirect ways. The first one is related to water consumption and pollution caused by housing, industrial and agro-industrial discharge of effluents. Precarious distribution of sewage is still relevant data, 45% of the Brazilian population does not have access to the sewage system (BRASIL, 2017). This demonstrates that urban sanitation planning and population growth in Brazilian cities didn’t keep pace, which causes disruptions for water bodies' quality and drainage systems infrastructure functionality. This last one is often used as a sewage network through clandestine connections. All of these facts imply situations of socio-environmental vulnerability such as poor populations occupying areas of greater exposure to environmental risks.

Indirect ways can be related to conventional drainage solutions adoption, irregular occupation of rivers bed and margins, high rates of soil waterproofing, riparian vegetation suppression, diffuse pollution and sediment deposition and others. These are variables that alter river systems morphology to a greater or lesser extent, it also causes hydrological instability to a channel or an entire drainage basin (PELLEGRINO et al, 2006). In such drainage basins where the effect of infiltration is important, the impact of increasing impermeable area is generally greater, causing flooding. In natural systems, these basins use wetlands areas - transition bands between terrestrial and aquatic environment - favoring water infiltration and streams slow recharge. In anthropized basins, this effect is almost nil, and thus, flooding occurs (GORSKI, 2010).

Empirical assumptions for indicator system construction

The literature review points out that indicators can be classified into two groups: environmental and sustainability. Environmental indicators express and communicate essential characteristics and meanings of an urban/environmental phenomenon to decision-makers and society, mostly simply and objectively. Sustainability indicators tend to measure development conditions based on environmental, social, economic and institutional aspects organized from specific, transversal and systemic indicators. Its goal is to suggest corrective or alternative measures for reversing the identified situation.

Wong (2016) defines that there are different methods to create indicator systems and weighting them. They can be derived from a literature review poll, tested for its applicability and weighed as to its relevance. Another method is to obtain the assessment and opinions of experts in the specific theme, in one or more consultations, to identify priority indicators and to weigh them or not. This interactive technique is well known as the "Delphi Method" (SACKMAN, 1974, apud WONG, 2016). Evaluation from public opinion can also be used, although this is not a common practice due to its cost and time involved for its creation. Whatever it may be, methodology applied must be consistent, relevant and it must reflect the interests of the whole society.

Wong (2006) states that data compilation does not guarantee the efficiency and effectiveness of public policies regarding its applicability. She also argues that no indicator can fully reflect reality´s complexity, in other words despite reducing the uncertainties of a phenomenon it does not eliminate them, which suggests a constant indicator system improvement. Besides that, the characteristics mentioned above demand articulation between the different areas of urban planning, time for maturation and refinement of evaluation criteria as well, which makes the construction of indicators somewhat complex and will not have a closure itself.

After all, the purpose of this research is to analyze the relationships between formal, spatial and functional in the composition of urban occupation and how these relationships impact rivers' environment quality in Brazilian cities. Therefore, the first step for this process is the definition of guidelines for an indicator system creation. Thus, the empirical research consisted of a questionnaire applied to experts from different fields of knowledge regarding water resources in the urban environment. Based on the Facet Theory (TF), data obtained were analyzed using a statistical model of Similarity Structures Analysis to correlate the cause and effects of the relationships mentioned above.

Facet Theory was developed by Louis Guttman in the 1950s and initially applied in the social sciences field. It has gained wider dissemination and applications in other fields of knowledge related to behavior involving evaluation of place (Canter, 1985). Monteiro and Loureiro (1994) define that the application of TF in the field of environmental assessment has demonstrated great significance, for instance it allows a clear description of multiple components from a physical environment and the way users experienced them.

Three types of facets were defined: population facet, represented by specialists; content facet addresses urban occupation (referent facet), the mode of occupation (focus facet), the river environment (domain facet) and the level of coverage (level facet); and the possible responses in

this research (range facet) will be represented by a 7-point Likert scale. The literature review suggests that urban-environmental impacts have several characteristics: character, magnitude, importance, duration, temporality, order, reversibility, cumulativeness, scale and synergy. In this research, urban impacts on river environment quality will be evaluated by a classification based on their positive or negative character, which determines the impact degree as very significant, moderate, less significant and not significant. Therefore, the 7-point Likert scale considers: *very positive, positive, less positive, no impact, less negative, negative and very negative.*

Population facet corresponds to a group of individuals who will assess the impact conditions, besides, this facet will not be part of the mapping sentence. Data obtained on the profile of the specialists will compose external variables, which deal with gender, age, qualification achieved, area of training, time of graduation, workplace and region in which they work in the country.

Referent facet (R): Urban Occupation

This facet deals with the universe of elements referring to urban morphology. Morphology presumes an organization and structuring of elements to be learned through the object-observer relationship. Elements must be related to both scales of analysis and conception of space, which means establishing the minimum elements of urban occupation that will be studied.

This research suggests variables identified as prominent elements in city composition which are also agents of river environment modification. After all, these elements are conditioned to several political, economic, cultural and temporal factors. However, the objective of this research is to identify the patterns and morphological city structures that have the greatest impact on river systems. These patterns will be structured in forms of variables that make up the urban occupation facet.

First of all, the variable *function* of urban occupation is considered able to cover social and economic aspects within the space. So the arrengment of this variable can result in more than one question to the same combination of variables. The following classifications are understood as a type of land use that organizes urban social functions: residential; commercial and industrial; mixed-use; and open spaces (related to squares, gardens and urban parks). While economically, income aspects such as upper, middle and lower classes will be adopted to describe the social aspect.

Second, *form* is another important variable to study urban occupation and its aspect must address the proper scale to water bodies. Therefore, this research considered that physical characteristics of urban settlements such as lot, street and block can directly influence river environment quality. These elements change depending on their geometric characteristics or the natural aspects of the site, *form* will be considered as, for example, a street may have a regular or irregular layout, be spontaneous or formal, high or low density; a block or a neighborhood can be on rough or flat terrain, located on the summit or valley of terrain, among others.

The third variable is *space* which consists of the following parameters: physical and visual accessibility of the river and its banks; constitutivity, which corresponds to the spatial transitions between buildings and space around it; continuity or discontinuity of urban space or

watercourse; location of the river concerning the regions of the city, whether it is centralized or isolated.

Focus facet (M): Mode or intensity of permeability and load of pollutants

Impacts on the river basin can occur through direct and indirect ways. Direct ways consist of housing, industrial and agro-industrial waste dumps, in consequence of a not closed cycle of consumption. Indirect ways are represented by the removal of riparian vegetation, poorly planned construction of hydroelectric plants, poorly planned use and soil occupation and diffuse pollution, the last one generated by contaminated effluvium from urban and agricultural areas. Based only on the urban environment, this research concludes that direct ways can be related to the *intensity of the load of pollutants* released in watercourses, while indirect ways can be related to the *intensity of soil permeability*.

Domain facet (D): River Environment

Domain facet will be used as conditioning factors for the *water* quality, it will depend on the relationship between urban occupation and aspects of infrastructure. Domain facet can be interpreted as temperature, color change, smell and pollution rate increased in watercourses, mostly because of the presence of pipes and sediment transport to the watercourse described in the sentences.

Margin is used as a variable regarding the physical structure of the water body. According to Cardoso (2012) this variable corresponds to the ebb bed where the drought flows occur; to smaller bed, the main bed where the dominant flow occurs; and the largest bed occupied, periodically, by floods.

The third variable corresponds to *habitat* and refers to flora and fauna. Those elements are considered intrinsic, since changes in flora cause impacts on the presence and permanence of local fauna. Impact on them can be caused by human occupation, which is indirectly related to morphology (density), typology and infrastructure. A combination of *habitat* variables with variables from urban occupation (referent facet) allows the identification of several situations, such as the presence of industries along a basin that may impact the permanence of local fauna or cause the proliferation of certain types of bacteria in water.

Level Facet (N): Scale

This facet guides the impact scale between local or general. The *local* variable refers to a section of the water body, for example, the section of a river involving the bank and the bed, at a certain point upstream or downstream. The *general* variable refers to the impact dimension on a hydrographic basin-scale as a whole. Depending on the size of the river *scale* refers to a neighborhood or one or more cities.

CONCEPTUAL FRAMEWORK

Facet theory structured the outline of this investigation into the following mapping sentence for the assessment of urban impact on river environment (Figure 01). The mapping sentence was created according to the P-S-R framework (pressure-state-response), it must determine the elements of urban occupation (R) which will be investigated, modulated by a higher or lower level of permeability intensity and pollutant load (M) (pressure), which are factors that interfere in elements qualities that make up the river environment (D) (state). The effects/variations can vary in scale (N1 and N2), depending on the combination of variables.

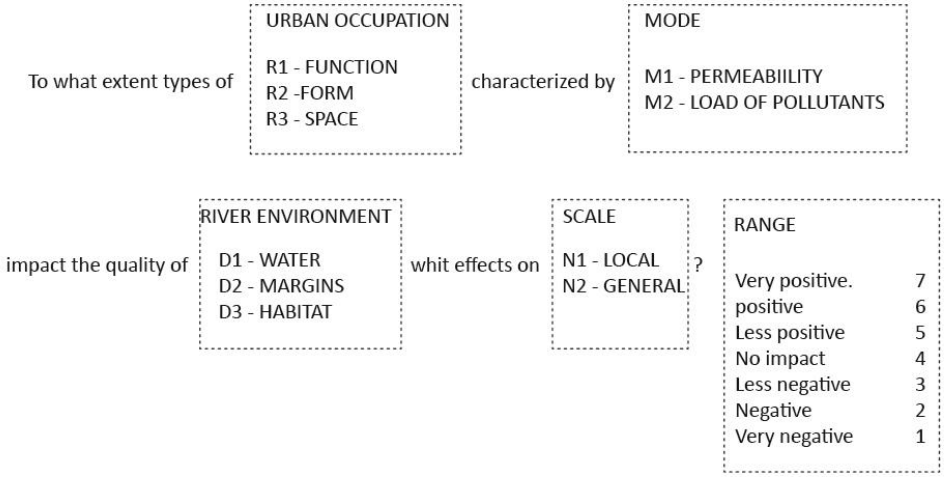

Figure 1. Mapping Sentence for the Assessment of Urban Impact on the River Environment

The first part of the questionnaire is to obtain data related to experts profile. The second part was composed of specific research questions derived from the mapping sentence. Considering no variation between questions the mapping sentences allowed a minimum of 36 questions (R3xM2xD3xN2=36), although variations were considere totaling 58 questions. The first part of the questionnaire consists of a block of 7 questions, while the second part was divided into 4 blocks, the first is a set of 14 questions, the second consists of 15 questions, the third with 13 and the last with 9, with an approximate duration of 20 min.

The final questionnaire was available for response during 22 days, which began on May 17th through June 8th, 2019, through the Qualtrics platform. Data collected were analyzed in SPSS, to investigate possible statistical inconsistencies. Once corrected, data were posted on the Hudap platform, which performs the Similarity Structures Analysis - SSA.

Impacts of urban occupation on river conservation: structures and evaluation guidelines according to facet analysis

The SSA projection correlates data about experts profile with the set of conditions presented in the questionnaire in a projection plane or Euclidean space (Figure 2). The external variables plotted in the projection do not change the structure of the data, but they are also located in regions where

there is a greater correlation of responses, according to each external variable: age, gender, specialization or time acting.

Thus, projections were evaluated individually in the light of the theory that underlies this research: systemic thinking and ecological urbanism. General discussion bellow presents a synthesis about the projection of each facet and an analysis of the set of projections. Facet structure confirms that there is no homogeneity in the assessment of urban impacts on the river environment.

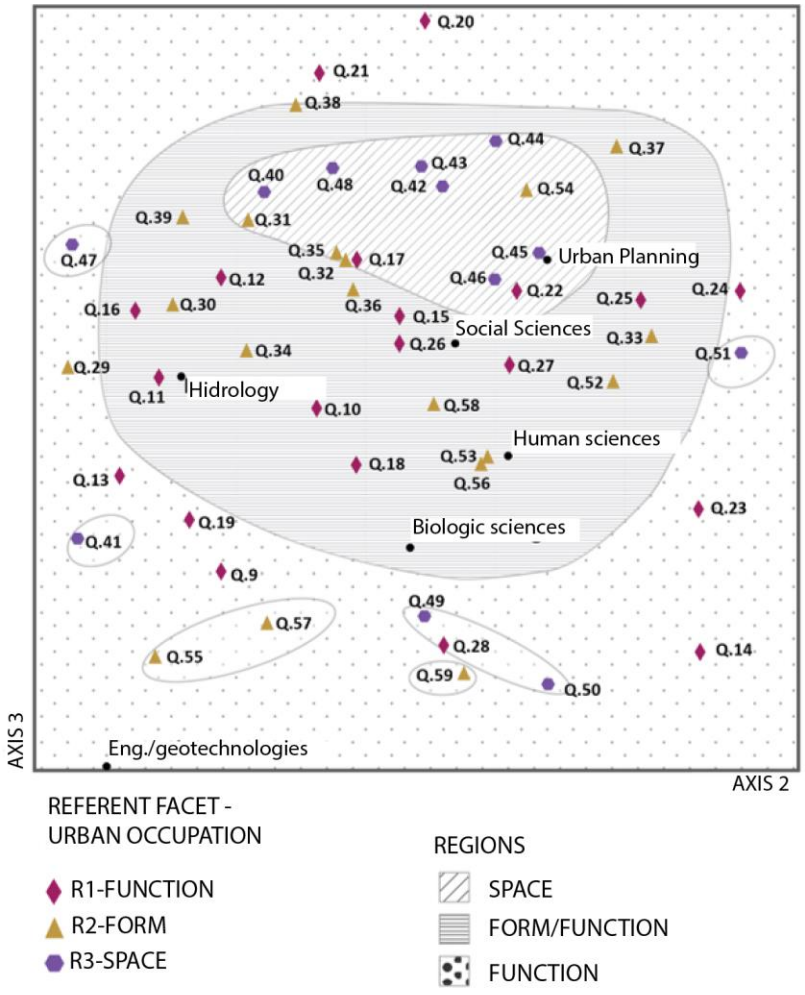

Figure 2. Projection Plane of Urban Occupation (Referent Facet) and Mode (Focus Facet)

Referent facet projection presents a hierarchical relationship between the variables *space, form and function*. It is noticed that *space* is seen as general characteristics, located in the center of the projection, correspond to a less impact on the systems. At the periphery of this projection are *function* variables, which have the greatest impact and are presented as specific situations. Around the center there are *form/function* variables, which were not foreseen in the mapping sentence with

that organization. However, they represent parameters of two variables that correlate and have some considerable impact, positive or negative.

Focus projection demonstrates that *permeability* and *pollutant load* are mostly understood as different elements, organized hierarchically, in which pollutant *load* has a greater impact on the river environment quality and may be associated with some *permeability* variables. On the opposite diagonal, there is an arrangement of *permeability* variable mostly about positive aspects in the upper part of the projection, and negative aspects (or impermeability), in the lower part of the projection.

Domain and *level* facets did not present a clear and orderly structure. It can be understood as a

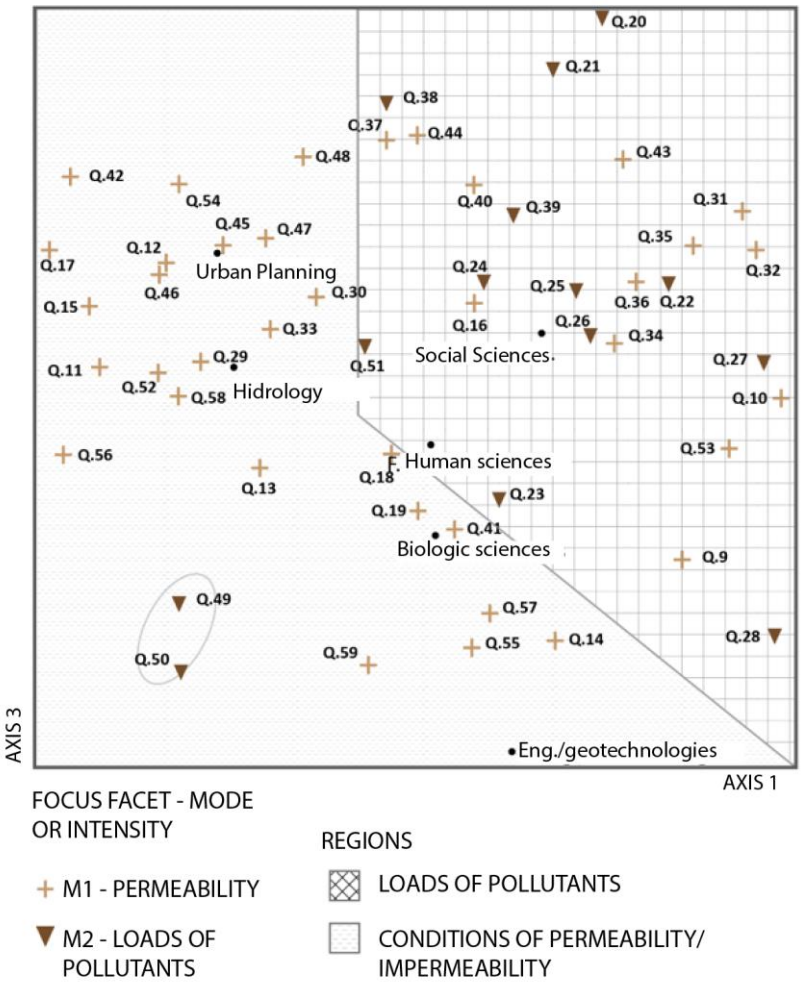

Figure 3. Projection Plane of Focus Facet – Mode or Intensity.

systemic relationship between them. The *level* facet did not configure a specific relation among the data as it was expected. The lack of more detailed scenarios may have caused its insufficiency correlation. However, it is concluded that difficulty does not hinder the analysis of the results, since many impacts are not restricted to a local level only, but also have consequences for other organization levels of organization as well as it can have a cumulative character.

The mapping sentence foresees that the *focus* facet must present urban occupation characteristics that are determinant for the cause of any impacts. In other words, it modulates the sense of *domain* facet, thus positive and negative aspects are grouped into opposite regions. Negative aspects are concentrated on the right and at the bottom of the projection, while the positive aspects are located on the left side (Figure 3). It is concluded that the *focus* facet confirms the hypothesis established in the mapping sentence, that the two variables (*permeability* and *pollutant load*) influence the quality of the river environment and modulate the result of the *domain* facet.

The behavior of the different profiles of the interviewees, as can be seen in the projection planes presented, shows the complexity of the topic addressed. It is understood that there is a very broad and divergent view between different fields of knowledge that work on urban planning. Its is concluded that a more open discussion and approach on the restoration of urban rivers in an interdisciplinary and transdisciplinary way is necessary.

The set of variables allows us to say that *function, form/function* and *space* play a hierarchical and dominant structure in urban occupation, with quantitative characteristics that can be measured within the entire system. However, given the circumstances of large social disparities in Brazilian urban spaces, the variable *function* is seen as the most specific element for the impact on water bodies, and the *form/ function* is seen as a most intermediate region.

Focus facet plays a hierarchical role over urban space, as well as the significance of the impact generated, confirming the theoretical basis of this research. The socioeconomic and specific use characteristics were modulated in the sentences by the presence or not of infrastructure. However, the attribution of characteristics with negative impact is attributed to favelas, even if some infrastructure can be found on them.

Domain and *level* facets reveal a correlation between different variables, confirming the systemic thinking that involves an intrinsic relationship between variables in natural and urban environments. In other words, impacts of urban occupation have consequences in several elements that make up a water body, simultaneously impacting different territorial scales, to a greater or lesser degree.

CONCLUSIONS

The challenge of capturing all types of impacts and the multivariate relationship among urban space calls for a theoretical exercise, aiming to identify a hierarchy among these innumerable elements and, mainly, their possible causal relationships. The focus of this research established the set of facets that would allow us to understand the current connection between the patterns of urban occupation with conservation or restoration urban rivers in Brazilian cities.

After all, a comprehensive assessment of existing conditions created from this structure could not clearly define all the particularities in situations according to the mapping sentence. The Smallest Structure Analysis (SSA) of data contributed to the following understanding: when it comes to issues related to the river environment, the experts' view is considered systemic. The properties and impacts on parts that make up rivers are seen as properties and impacts as a whole, that is, they are elements in constant interaction. However, experts' view on urban occupation suggests a

hierarchical structure of elements that define priority and other general nature, such as spatial relations. The divergent view between different fields of knowledge that operate in urban planning raises questions about the solutions that have been adopted in Brazilian cities, as well.

Projection planes show that while engineering/geotechnology tends to agree with the most negative and often technical issues, urban planning and hydrology tend to agree with issues dealing with alternatives that minimize impacts generated by occupations that are focused on spatial aspects. It is not intended to state that it is a question of professional base in one or another specific area, although to achieve a more transdisciplinary actions, a greater interdisciplinarity theoretical-methodological or technical knowledge is evident when dealing with the theme involving urban rivers.

The following phase of this research articulated the group of variables to identify specific problem aspects and define some guidelines. Thus, combining "*space* and *form*" we aim to insert river environmentally into the urban fabric, taking into account the emotional and sensory aspects. In other words, guidelines should correspond to the meaning of space from aesthetic qualities that can be attributed to rivers. The goal of combining "*space* and *function*" is to insert the river into the urban fabric, considering urban space functionalities, which corresponds to the meaning of space based on its function for society. Finally, "*form* and *function*" must qualify urban infrastructure, considering river conservation, the growth of urban occupation and urban space qualities in the vicinity of rivers and its drainage basin, it must deal with aspects related to the function of space, associated with the quality of its infrastructure addressing the relationship of urban design.

The path followed opens up to new developments, still relevant to the construction of the indicator system, such as identifying information already available in government and institutions databases and expanding the scope of indicators to other components, for example, water resource management at the city level and associate it with existing indicators that deal with water quality. Finally, this research highlights the degradation of urban rivers from different facets, to clarify how the effects of urban occupation are taken by experts. The application of Facet Theory allowed this exploration through a variable structure of analysis and suggested an integrated knowledge about the studied phenomenon. It also evidenced that to reach a condition of respect and harmony between the built environment - city - and natural environment – the river is necessary to reach compatibility among experts' perceptions from different realms.

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THE PERCEIVED VISUAL QUALITY IN OFFICE SCENES

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ABSTRACT

This article aims to evaluate the perceived visual quality in office scenes. Two characteristics of environmental elements of offices were studied - contrast and complexity – because of their likely influence on perceived visual quality. The empirical investigation, designed according to Facet Theory, used the Multiple Sorting Procedure to collect the data from 34 specialists in environmental design and 36 non-specialists, analyzed using the non-metric multidimensional procedure of SSA, with the aid of the HUDAP computer program. The findings are structured in accordance with the categories and their theoretically deduced interrelations. In this context, medium contrast and maximum complexity increase the perceived visual quality of office scenes.

INTRODUCTION

The visual characteristics of ambiental elements have an important impact on human experience, being able to evoke strong emotions and influence spatial behavior, leading people to avoid or go to certain places, based on their assessments and feelings.

Based on theories of psychology about aesthetics (Berlyne, 1972; Kaplan & Kaplan, 1989; Wohlwill, 1976; Nasar, 2008; Nasar, 2000), which favor project guidelines that help the human-environment interface, this article aimed to evaluate the visual quality perceived in office scenes.

Perceived visual quality is a psychological construct, which involves subjective assessments of the environment or human feelings about it, the former are called perceptual/cognitive judgments and the latter, emotional judgments. Although perceived visual quality may depend, in part, on perceptual/cognitive factors, it is, by definition, an emotional judgment involving evaluation and feelings, and that, to be relevant, must focus on the dimensions of evaluation that people actually use to assess the environment (Nasar, 1988).

Perceived visual quality in office scenes was evaluated in this research through the perceptual/cognitive judgments of respondents from two different groups, involving 34 specialists in the design of environments and 36 non-specialists, focusing more on consensual responses and leaving aside individual differences.

Although environmental preferences and meanings vary from individual to individual, it is possible to make some generalizations about how humans respond to environments and bring order to apparent variability. Thus, by highlighting areas of agreement, or universal principles, individuals may not fully agree on the responses to a given environment, but there are enough overlaps between them to make some generalizations about the responses, as one can both evaluate and measure shared preferences and meanings. (Nasar, 2000).

Perceived Visual Quality

Of the variables considered relevant to environmental assessment, several emerged as prominent for how human beings experience their physical environments. Two of them, coherence (obtained by reducing contrast) and complexity, were taken for study in this research due to the relevance of both for the perceived visual quality in environments. For Kaplan & Kaplan (1989), authors who improved the knowledge of human preferences for environments, coherence refers to the degree to which a scene fits or makes sense; complexity refers to the diversity and visual richness of the scene.

Bearing in mind that people's preference for environments depends on their purposes, Kaplan & Kaplan (1989) also point out two underlying purposes that people are always considering, and argued that there is a predisposition for environments with coherence and complexity, since, respectively, the first relates to the need for the environment to favor "making sense", so that its structure can be perceived; as well as promoting “involvement”, so that you are challenged when processing information successfully.

In relation to coherence - obtained by reducing contrast - people tend to prefer environments that promote understanding so that one can act on them. This “making sense” component has emerged as a prominent dimension of the human response to the environment, and research consistently finds the preference associated with coherence. Thus, it is suggested that high coherence (low contrast) elevates the preference for environments, is reduced for medium coherence, and is lower for a scene of low coherence (high contrast).

Complexity is also consistently identified as a prominent dimension in the evaluative responses to environments. This variable involves a number of different elements and the distinction between them in the scene. Scenes with few elements, or many similar elements, seem relatively simpler than scenes with many different elements. Environmental preference surveys generally suggest that moderate complexity is most associated with this assessment (Nasar, 2000). Corroborating the pioneering findings of Berlyne (1972) on visual preferences for images, Wohlwill (1976) found that preference for environments has an inverted “U” shape in relation to complexity, that is, a level of moderate complexity of the environment would be preferred over minimum complexity and maximum complexity.

Conceptual Framework

Facet Theory structured the outline of this exploratory investigation into a mapping sentence for the assessment of perceived visual quality in office scenes (Figure 01), which relates the theoretical and empirical elements of the research to its possible results. In this mapping sentence, the three main types of facets were defined and are related to the sample population (population facet); two characteristics of the environmental elements that outline the investigation, contrast and complexity, were taken from the literature on the subject (content facets); and the possible responses in this field of research (range facet).

This research designed as a semantic sentence initially defined the sample groups to be considered: specialists and non-specialists in environmental design; three levels ordered for the contrast facet (Facet A): (A1) low contrast, (A2) medium contrast, (A3) high contrast; as well as for the complexity facet (Facet B): (B1) minimal complexity, (B2) moderate complexity; (B3) maximum complexity

To what extent does person x (specialist | non-specialist) assess that the environmental characteristics of			
(FACET A) **CONTRAST**		(FACET B) **COMPLEXITY**	
(a1) low contrast		(b1) minimum complexity	
(a2) médium contrast	and	(b2) moderate complexity	facilitates ⟶
(a3) high contrast		(b3) maximum complexity	
RANGE			
(1) nothing			
(2) little			
(3) more or less			being and staying in offices
(4) a lot			[expression of perceived visual quality]
(5) too much			

Figure 1. Mapping Sentence for the Assessment of Perceived Visual Quality in Office Scenes

The internal elements of the two content facets - contrast and complexity - can be organized in a similar way to a combinatorial analysis, producing nine different sets (A3xB3=AB9), which convey a specific ordered relationship to be evaluated through a range for this domain, linked to a scale with five points (nothing; little; more or less; much; too much), which are elements of the range facet.

Having said that, the assessment of perceived visual quality in office scenes was explored in this research based on the initial hypotheses that: (i) there is no consensus on the results among the participants of the two different groups surveyed; (ii) the perceived visual quality is related to low contrast (high coherence) and moderate complexity in office scenes.

The mapping sentence, as an initial research hypothesis, is analyzed in relation to the empirical results that should corroborate or refute this structure. Thus, after the interpretation of the data and in the final phase of the research, there is enough information to construct, or not, a new mapping sentence as a direct consequence of the empirical results obtained.

METHODS

Samples

The population that was evaluated in this research has two different types of experiences with office scenes. One is specialized in the subject, having scientific knowledge; the other is non-specialized, being more influenced by common sense. The different groups, separated by their experiences and activities, are specialists and non-specialists in environmental projects.

In the first group, interests of a technical nature predominate. In this group were: interior architects and designers, generally responsible for new installations and office renovations. In the second

group, occupational and experiential interests prevail. Part of this group are: people who work in offices - frequent users - regularly exposed to visual stimuli in this type of environment.
Without the use of probabilistic sampling techniques, the intentionally selected participants were contacted by phone or social networks and at the end of the data collection, there were 70 respondents, 34 of whom were specialists and 36 were non-specialists in environmental design. The majority were women, aged between 26 and 30 years old, and with a complete level of higher education.

Data Collection Method

This research made use of the Multiple Sorting Procedure to collect the data - from an updated approach by Canter, Brown & Groat (1985) - requesting that the participants classify nine scenes of offices initially through criteria defined by themselves (free sorting), and then, criteria established by the researchers (directed sorting), aiming to understand the extent to which each of these scenes were perceived as having visual quality.

The generation of this set of nine office scenes is directly associated with the variables in this research, all listed in the mapping sentence for the assessment of the visual quality perceived in office scenes, which expresses the way in which the elements that define the investigation are related, that is, the systematic manipulation between three different ordered levels of contrast and complexity in the environmental elements of offices (Figure 2). These scenes, selected from the image bank of "Google Image" offices, were submitted to a body of 5 judges, who were students of the Graduate Program in Design at the Federal University of Pernambuco, in order to seek a visual consensus for the levels indicated in each scene.

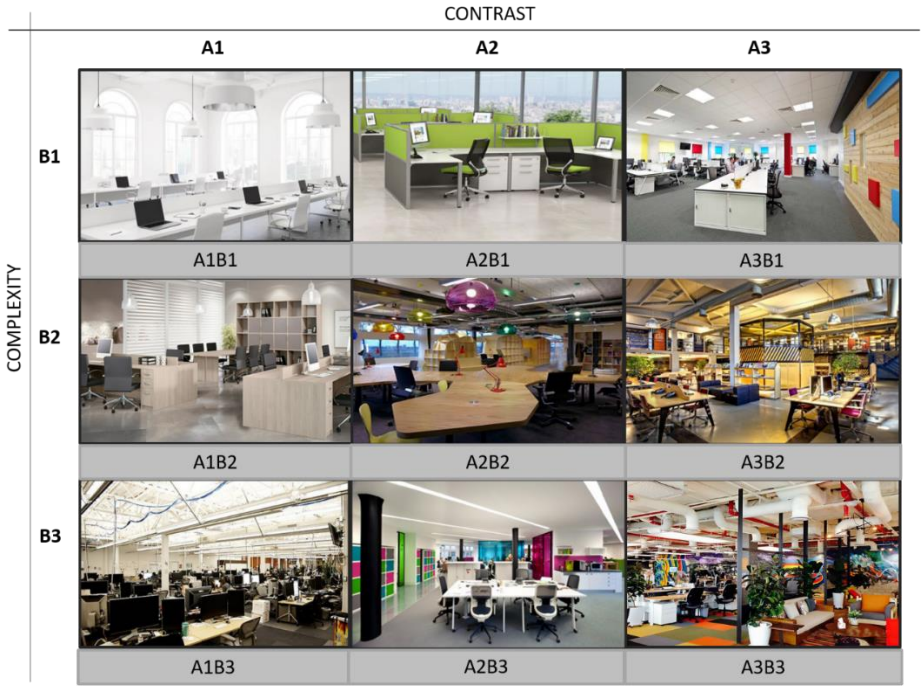


Figure 2: Scenes of offices representing the relationship of contrast and complexity (Image bank of "Google Image" office scenes)

Although evaluative responses, alone may not predict the user's actual behavior, the combined assessment of evaluative responses and expected behavior gives a good indication of actual behavior (Nasar, 2008). Therefore, in this research, respondents were asked to indicate the extent to which various office scenes favored visiting and staying.

All classifications performed by the participants in this research were duly registered in a specially developed form. As all participants were subjected to the same procedures, a single model was used to identify respondents during data analysis, in addition to being essential for noting the number of office scenes associated with a certain established and similar group.

Method for Data Analysis

The data obtained in the targeted classifications were analyzed using SSA (Smilarity Structure Analysis), introduced by Guttman (1968), with the aid of the HUDAP computer program (Hebrew University Data Analysis Package), developed by Amar & Toledano (2001).

SSA is an intrinsic geometrical technique for analyzing multivariate data, which emphasizes regions in the spacing of variables rather than the coordinates. It therefore allows a graphic translation of the numerical matrix. In this technique, each variable (office scenes in this research) is presented as a point in a Euclidean space, such that the greater the correlation between two variables, the closer they are in space. The space used is the one with the lowest dimensionality that allows an inverse relationship between all pairs of observed correlations and the observed geometric distances. Only the relative sizes of the coefficients and the relative distances are of concern. Taking into account all possible combinations, the computer program creates an ideal graphic solution (Bilsky, 2003).

The analysis of geometric projections produced by SSA can reveal implicit relationships and rules in the data obtained, which would be imperceptible in the usual quantitative analyzes, in addition to allowing the analysis of the consensus of results between the groups surveyed, since the program allows us to appreciate a single projection which shows, at the same time, the regional structure and the different groups as external variables, instead of doing it in isolation.

Before presenting the results, it is necessary to explain that external variables were plotted as external points in the SSA projection. To generate an integrated map capable of representing all data (content and external variables), two “dummy variables” were created from the “population” variable. The population variable was composed of two categories, corresponding to the group of specialists and another group of non-specialists in environmental projects.

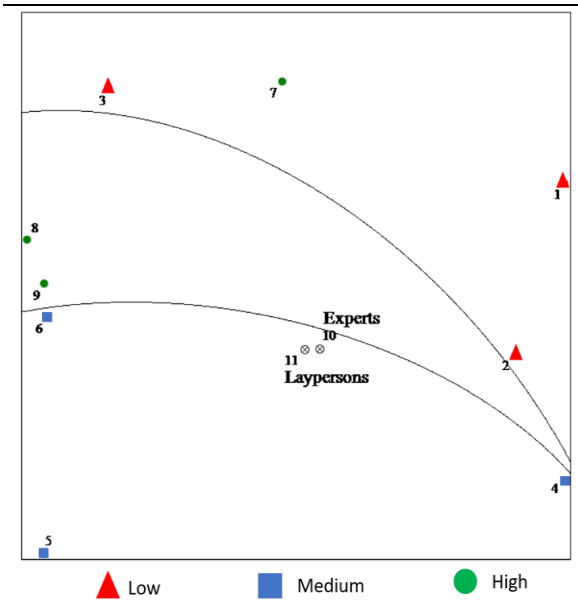
RESULTS AND DISCUSSIONS

To study the perceived visual quality in office scenes and their empirical structure, correlations were calculated for each pair of scenes evaluated. The results were displayed in a 9 by 9 correlation matrix and its inspection showed that half of the coefficients are positive and range from -.5 to +.89, reflecting negative or positive perceptions for the integrated effects of contrast and complexity of environmental elements of offices in the perception of visual quality. For example, scene 6 (A2B3) is highly and positively correlated (+.89) with scene 9 (A3B3). In fact, these two scenes are close on the SSA maps (Figures 03 and 04); scenes 5, 8, 9 (A2B2, A2B3, A3B3) are

negatively correlated (-.46) with scenes 1, 4, 4 (A1B1, A1B2, A1B2). Consequently, these six scenes are modularly opposed on the SSA maps (Figures 3 and 4).

The resulting SSA map for Facet A (Figure 3), contrast, shows, as a hypothesis, circular structures on the effects of this characteristic on the perceived visual quality in office scenes. The indicator, of what can be considered a central aspect of the contrast of the environmental elements of offices in perceived visual quality, is in the region of common origin of the SSA map for contrast, located in the lower circular shape of the map. This region concentrates scenes 4, 5 and 6, all with a medium contrast level in their environmental elements. The most specialized aspects occupy the outer region that spreads towards the periphery, that is, the low contrast level (high coherence). Therefore, according to this hypothesis, Facet A plays a modulating role in the partition of the SSA space.

The SSA map for Facet B (Figure 4), complexity, shows, in a similar way, circular shapes for the effects of this characteristic on the perceived visual quality in offices. The indicator, which can be considered a central aspect of the complexity of the environmental elements of offices in terms of perceived visual quality, is in the region of common origin of the SSA map for this characteristic, located in the circular shape in the left corner of the map. This region concentrates scenes 3, 6 and 9, all with a high level of complexity in their environmental elements. The most specialized aspects occupy the region that spreads towards the periphery, that is, with a minimum level of complexity. Therefore, according to this hypothesis, Facet B also plays a modulating role in the partition of the SSA space.



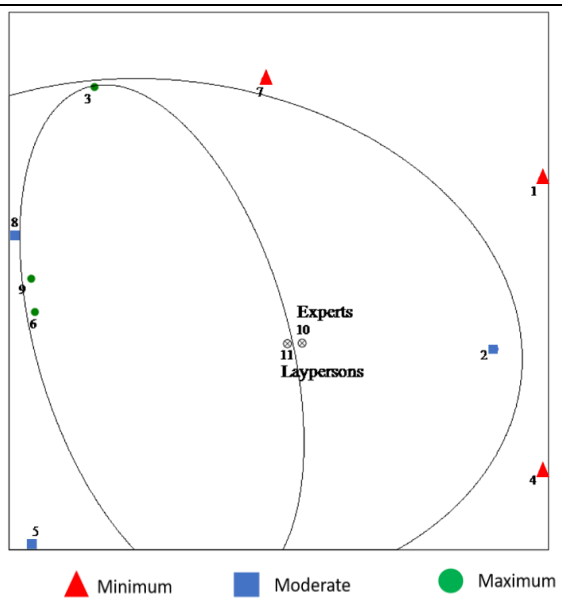


Figure 3 | Facet A (Contrast) C.o.A. = .07 **Figure 4 | Facet B (Complexity) C.o.A. = .07**

Space Diagrams for Dimensionality 3. Axis 1 versus Axis 2

In order to verify the consensus of the results obtained on the perceived visual quality in office scenes, the two different groups of respondents were inserted in the original SSA diagram as external variables.

Regarding the SSA map for contrast (Figure 3), it can be seen that both the group of specialists and non-specialists in environmental projects are located in the region of the diagram that brings together scenes of offices with medium contrast. This means that there is consensus in the findings that office scenes with medium contrast have more influence on perceived visual quality. This result differs from that suggested by the theory that low contrast, by increasing the coherence of the environment, favors perceived visual quality. Scene 7 (A1B3) should be in the high contrast region, but it appears in the low contrast region (more correlated with scene 3), suggesting that it was perceived by the participants in a different way to the one defined in the research. Such an exception does not invalidate the results, as the large gray mass of the floor may have softened the contrast between the warm colored elements.

Considering the SSA map for complexity (Figure 4), it is observed that the group of specialists is located in the region that brings together scenes of offices with moderate complexity; the group of non-specialists in environmental design is located in the region that is composed of office scenes with maximum complexity. Therefore, there is a divergence of the results obtained for complexity in relation to the perceived visual quality in office scenes, that is, while the group of specialists is more influenced by scenes of offices with moderate complexity, the group of non-specialists is more influenced by those with maximum complexity. This result partially differs from the theoretical suggestion that environments with moderate complexity are favored in terms of perceived visual quality.

The results of the SSA, both for the content and external variables, are corroborated by the mathematical data, relating to the scores for the office scenes obtained in the classifications. Therefore, scene 5 (A2B2), with medium contrast and moderate complexity, was perceived as having more visual quality by the group of specialists (Figure 5a); scene 6 (A2B3), with medium contrast and maximum complexity, was perceived as such by the group of non-specialists (Figure 5b). Conversely, scene 3 (A1B3), with low contrast and maximum complexity, was perceived by the two different groups as having less perceived visual quality (Figure 5c).

Figure 5a:
Scene with MORE Perceived Visual Quality (Specialists)

Figure 5b:
Scene with MORE Perceived Visual Quality (Non-specialists)

Figure 5c:
Scene with LESS Perceived Visual Quality (Specialists / Non-specialists)

Figure 5a/c: The perceived visual quality in office scenes
(Image bank of "Google Image" office scenes)

CONCLUSION

Although the tested variables refer only to two characteristics of the environmental elements of office scenes, it is believed that the evaluation carried out and the results obtained contribute to

the ongoing debate on the evaluation of environments, more specifically on their perceived visual quality, not to mention other empirical issues.

It was found that there is a partial consensus of the results obtained between groups of specialists and non-specialists in environmental projects surveyed in this research in relation to the perceived visual quality in office scenes, partially corroborating a formulated hypothesis. However, in this same context, inconsistency was found in the theoretical suggestion that the perceived visual quality in office scenes would be related to low contrast (high coherence) and moderate complexity, refuting the hypothesis initially formulated.

In relation to the research objective, to support project guidelines that assist in the human-environment interface, it was found that the office scenes with moderate contrast and maximum complexity of the environmental elements, contrary to what the theory suggests, influence the assessment of the perceived visual quality in office scenes according to the participants.

As a direct consequence of the results outlined here, the mapping sentence for the evaluation of perceived visual quality in office scenes was shown to be consistent as a conceptual procedure for the evaluation undertaken, insofar as both the facets and their internal elements were captured by the participants of this study.

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A BRAZILIAN VALIDATION OF THE ZIMBARDO TIME PERSPECTIVE INVENTORY FOR CHILDREN - ZTPI-C

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ABSTRACT

The present study aims to create and validate a version of the Zimbardo Time Perspective Inventory for children based on items adapted from the original adult ZTPI scale and the Negative Future Subscale. For that purpose, an instrument containing 69 items, divided into six main categories (past, present, and future, each with positive and negative perceptions), was applied to 675 boys and girls aged from 8 to 12 years from public and private schools in Brazil. Cluster analyses done on the items of each of the six categories, and a total of 27 items were removed due to their distance to the centroid. The remaining 42 items were then submitted to an SSA and the resulting diagram partitioned into a polar structure according to the principles of Facet Theory. The structure that was identified clearly shows the surviving items to be clearly organized into a sixfold structure corresponding to the predefined categories, albeit with two of them, Hedonistic Present and Fatalist Present, intermixed into one, which was interpreted as indicating a lack of differentiation due to the developmental level of the subjects. It is concluded that the 42 items arrived at comprise a scale that exhibits adequate construct validity for the dimensions of perception of time that it attempts to measure in Brazilian children. In addition, the specific structure found was interpreted in terms of the underlying theoretical framework from Zimbardo regarding the perception of time and its development in children.
Keywords: ZTPI-Children, Social Psychology, Psychometric, Human Development

INTRODUCTION

There is only one single word for "time", even though the term encompasses many different things, such as: natural and conventional time patterns, sequences of events, succession and duration and, finally, the all-important past-present-future distinction. The mental representation of time depends on biologically based abilities that are manifestly time-oriented, but it is also the result of general cognitive capacities applied to time (e.g. executive functions such as working memory and attention control, see Droit-Violet, 2016 for a review).

Children's distinction between past, present and future, so important for the adult perception of time, is known to emerge relatively slowly during childhood, and seems to be a successive developmental construction. The few studies that have investigated this distinction have adopted quite different approaches and specific methodologies.

Povinelli, Landry, Theall, Clark and Castille (1999) showed children video footage of past events and asked them to track the visual cues to infer the nature of current state, with children of 4-5 years, but not younger, being able to successfully pass the task. Friedman (2003) used another approach where children were directly asked to report differences in their view of past, present and future events, the results being that young preschoolers are often confused about past and

future events and it's only at about 6 years of age that such distinction seems to become clear. Similarly, Busby and Suddendorf (2005), using a verbal task, found that 4-and 5-year-olds could answer questions about both past and future equally well, interpreting their findings as a demonstration that the two temporal perspectives emerge in parallel. Hudson (2006), in contrast, showed that children find more difficult to engage in conversation about the future than about the past, suggesting that the ability to remember sequences of events may precede the ability to use such memories to flexibly plan for the future (see also Benson, 1997).

Running parallel to the aforementioned approaches is the study of children's conceptual understanding of time-related language, (i.e. the emergence and accuracy of use of common temporal terms, such as "yesterday", "tomorrow", or the use of past and future tense). Many studies using different methods, ranging from the analysis of children's narratives to structured experiments, examined when and how children acquire tense and temporal language (see Grant & Suddendorf, 2011 for a review). Their results indicate that the use and understanding of past and future tense seems to improve broadly between the ages of 3 and 7 years. Children around 4 and 5 years old can accurately report past and predict future events based on questions about "yesterday" and "tomorrow" (Busby & Suddendorf, 2005), whereas several terms representing conventional time patterns (e.g. "minutes" , "days", "current month" or "season", "day of the week") appear to develop only around 6 years of age (Friedman, 1991; Shatz et al., 2010).

In the last few decades, a new approach regarding the study of children's thinking about past and future events has emerged. The focus of this relatively recent attention has been the development of "imaginative thinking about non present events" or "mental time travel" (MTT), as it is called (Suddendorf & Busby, 2003). Although MTT has been described in many different ways, basically all theorists agree on three important aspects (Coughlin, Lyons & Ghetti, 2014). The first one is that MTT constitutes a flexible type of thinking about events in the past and the future, a sort of mental simulation of future events that recombines details from one's personal past. The second is that thinking about the past and imagining and/or anticipating the future have common underlying mechanisms (i.e. cognitive, neuronal, cf. Addis, Wong & Schacter, 2007). Finally, the third one is that children's MTT is only firmly established relatively late in the cognitive development process, i.e., around the age of 4-5 (McColgan & McCormack 2008).

Of course, the distinction between past, present and future is essential in order to grasp the complexity of both the physical and social world. The research also seems to suggest that such an understanding is acquired by 4-5 years of age and becomes more consolidated at the end of the pre-school period (Friedman, 2003, 2005).

However, many unknowns need to be addressed. **First**, there is a lack of prior research on the development of children's view of past-future-present during late childhood (8-12 years of age). Knowing more about this specific period would help to trace a more complete developmental trajectory of children's temporal knowledge. **Second**, little is known about children's time perspective as "*the totality of the individual's views of his psychological future and his psychological past existing at a given time...*"(Lewin, 1951, p. 75). Are children at the end of childhood more future oriented? Or, perhaps, more present oriented? Could 8-9 year-old children hold a "positive" or a "negative" view of their past? **Third**, previous studies on children's time perspective have tended to focus on a single dimension, such as the past or future, or both, without

simultaneously investigating the totality of the child's time frames (past, present and future). By focusing on one or two dimensions only, previous studies failed to provide assessments of the relative strengths of the other dimensions within individual temporal profile. **Finally**, to date no studies have investigated the developmental aspects of time perspective by adopting a questionnaire methodology based on children's report. The majority of studies have been using experimental paradigms, as well as children's open narratives. Few studies adopted a parental questionnaire or, more specifically, parental reports of children's production of temporal terms (see Grant & Suddendorf, 2011).Thus, the inherent difficulty of dealing with abstract temporal terms and problematic issue of external validity (due to investigating children through experimental paradigms) suggests the adoption of a methodology using a reliable and valid time perspective inventory suitable for children between 8 and 12 years old.

Aims of the present study

As previously mentioned, little is known about how and when children develop their concepts of time perspective, and one of the reasons for this might be the difficulty of finding a reliable measure. Therefore, the aim of the present investigation is to address that gap by examining children's time perspective in late childhood and adopting a time perspective standardized scale, i.e., the Zimbardo Time Perspective Inventory – ZTPI (Zimbardo & Boyd, 1999; Carelli, Wiberg & Wiberg, 2011). Another aim of the study is the validation of ZTPI for Children - ZTPI-C, including both an evaluation of its psychometric qualities and its suitability for investigating time perspective during late childhood. It is hoped that the present study will be a step towards achieving an integrated picture of children's time perspective, a contribution to the ongoing debate about the nature and timing of children's understanding of temporal concepts

METHOD

Participants

A total of 675 children. 51.5% of which were girls, aged from 8 to 12 years (M = 10.4, SD = 1.20), from Brazilian public (58.2%) and private (41.8%) schools. Table 1 presents a more detailed description.

Table 1. Distribution of the type of school, sex and age of the participants

Type of School	Sex	Age								Total
		8-9 y.		10 y.		11 y.		12 y.		
		N	%	N	%	N	%	N	%	
Public	Male	46	*24.9*	36	*19.5*	59	*31.9*	44	*23.8*	185
	Female	61	*29.3*	25	*12*	68	*32.7*	54	*26.0*	208
	Total	107	*27.2*	61	*15.5*	127	*32.3*	98	*24.9*	393
Private	Male	29	*20.4*	53	*37.3*	37	*26.1*	23	*16.2*	142
	Female	22	*15.7*	58	*41.4*	32	*22.9*	28	*20.0*	140
	Total	51	*18.1*	111	*39.4*	69	*24.5*	51	*18.1*	282
Total	Male	75	*22.9*	89	*27.2*	96	*29.4*	67	*20.5*	327
	Female	83	*23.9*	83	*23.9*	100	*28.7*	82	*23.6*	348
	Total	158	*23.4*	172	*25.5*	196	*29.0*	149	*22.1*	675

Instrument and Procedure

The construction and validation of an instrument meant to measure children's time perspective, the Zimbardo Time Perspective Inventory for children, ZTPI-C, followed four successive stages. Initially there was the analysis by judges of the adaptation of the original items for adult ZPTI (Leite & Pasquali, 2008), which is comprised of five subscales: Present-Hedonistic (PH), Present-Fatalistic (PF), Past-Positive (PP), Past-Negative (PN), Future-Positive (FP) and, additionally, the subscale of Future-Negative (FN) from Carelli, Wiberg and Wiberg (2011). This adds up to the 69 items of the ZPTI-C, with the semantic analysis done in the form of a game with a reference group; the pilot study for adjustments in the form of application and the validation study. The list of the 69 items used in the investigation is in the Appendix (Portuguese and English versions).

RESULTS

In the validation study, initially a traditional exploratory factor analysis was performed, using the principal components (PC) technique generally deployed in the literature, failing to clearly show the expected factors corresponding to the six subscales. Based on this result, cluster analyses were performed on the items of each of the six categories, and a total of 27 items were removed based on their distance to the centroid. The remaining 42 items of the ZTPI-C were then submitted to an SSA considering as external variables (e) the dummies for sex (male and female), school (Private and Public), and age (7-9 y., 10 y., 11 y. and 12 y.). The resulting diagram was partitioned into a polar structure according to the principles of Facet Theory (Figure 1).

The SSA on Figure 1 shows a structure where one can identify five distinct polar partitions. Four of those partitions correspond precisely to the Past Negative, Future Negative, Past Positive and Future Positive items. The other partition is a mixture of the Present Fatalistic and Present Hedonistic items, though one can note that the deviation from a clear separation between them is due to only two of the seven items of Present Fatalistic being too far to the right (PF.49 and PF.50) and only three of the ten Present Hedonistic items being too far to the left (PH.21, PH.31 and PH.39). Considering the imperfect division between PF and PH based on where most of the items of each type are located, along with the perfectly defined other partitions, it is possible to envision an axial partition that broadly defines the Negative (to the left and downwards) and Positive (to the right and upwards) items in the scale as a whole.

The structure found fits the six-fold structure one would expect for the ZTPI-C, except only for some relatively small distortions in the mixed PF-PH partition, which can be interpreted as indicating a lack of differentiation between these dimensions due to the developmental level of the subjects. These findings also suggest and overarching axial structure differentiating Positive from Negative items regardless of Past-Present-Future.

The positions of the external variables in the SSA were such that:

- The ages of 8-9 were on the Positive side of the diagram (Future Positive), whereas the ages of 10, 11 and 12 were on the negative side (respectively, Future Negative, Past Negative and the mixed PH-PF);

- Private schools were on the Future Negative partition and Public Schools on the mixed Present Fatalistic-Present Hedonistic partition;
- Being Male was on the Past Negative partition and being Female on the mixed Present Fatalistic-Present Hedonistic partition.

The Biserial Point Correlations on Table 2 confirm these tendencies. The sequential positions of the age groups on the SSA diagram suggest a clockwise developmental process along the polar structure starting from Future Positive and going towards the mixed Present Fatalistic-Present Hedonistic partitions, the latter not yet being differentiated likely due to the fact that these two perceptions of time are the last to develop. It is also of interest that the starting point is on the Positive side of the diagram, but then rapidly develops to the Negative side.

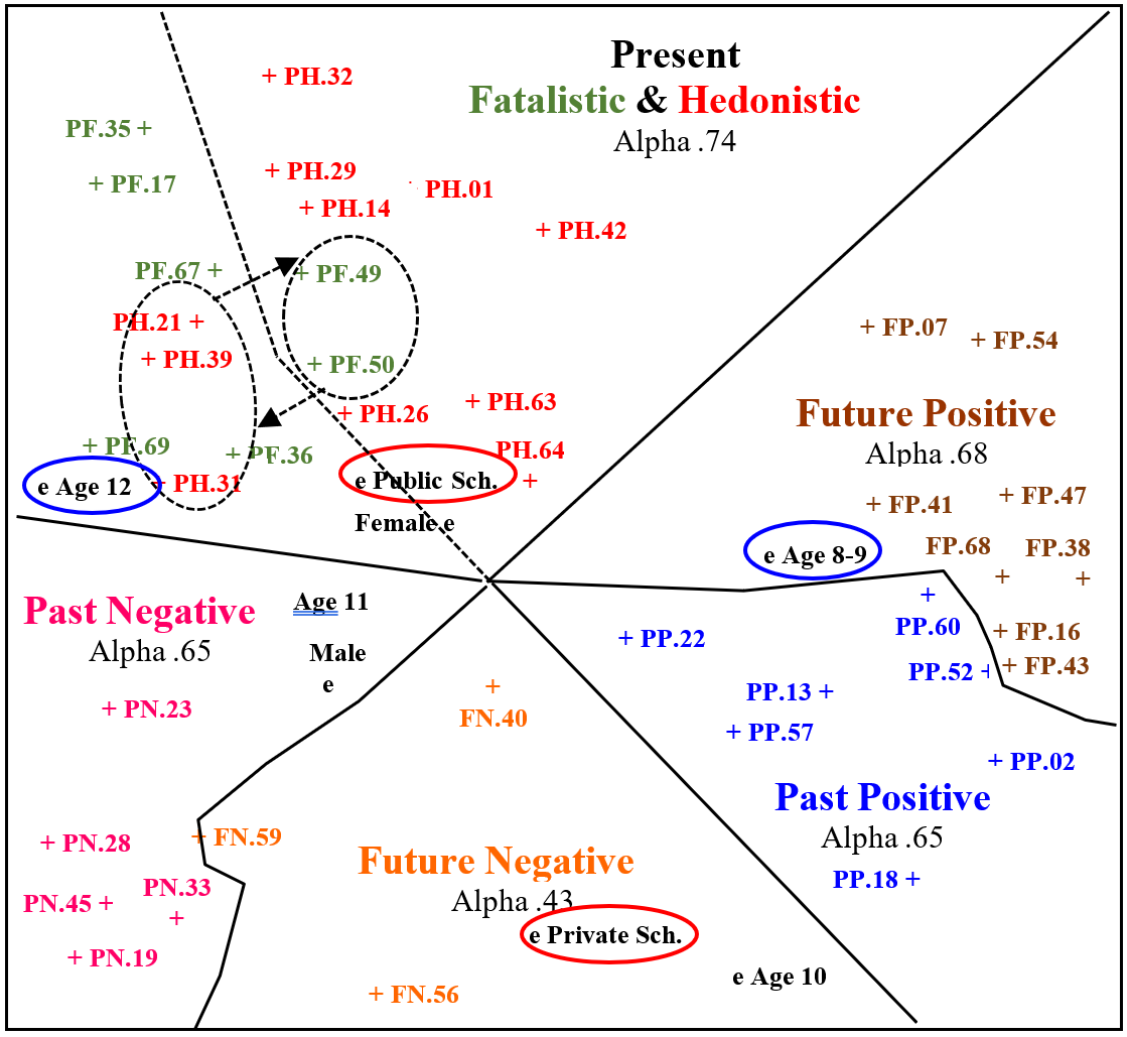

Figure 1. SSA map of the 42 items of the ZTPI-C considering as external variables (e) sex (2: male and female), school (2: Private and State), and age (4: 7-9 y., 10 y., 11 y. and 12 y.) (1x2, 3-D, coefficient of alienation.18).

Table 2. Point-Biserial Correlation and P-Values between the five dimensions of the ZTPI-C and School, Sex and Age

ZTPI-C Dimensions		Private. School[a]	Male[b]	Age 8_9 y.	Age 10 y.	Age 11 y.	Age 12 y.	Age[c]
PH & PF Present	r_{pb}	-.060	-.003	.012	-.035	.016	.020	.022
Fatalistic & Hedonistic	p	.114	.928	.761	.355	.670	.600	.558
PP Past Positive	r_{pb}	.070	-.050	**.147****	.057	-.062	**-.144****	**-.194****
	p	.066	.189	**.000**	.133	.105	**.000**	**.000**
FP Future Positive	r_{pb}	-.060	.024	**.142****	.012	**-.100****	**-.104****	**-.197****
	p	.113	.524	**.000**	.744	**.009**	**.006**	**.000**
PN Past Negative	r_{pb}	-.034	**.078***	-.014	-.020	.035	-.013	.006
	p	.375	**.041**	.712	.592	.365	.736	.878
FN Future Negative	r_{pb}	**.132****	-.024	-.049	.034	-.008	.039	.052
	p	**.000**	.538	.201	.366	.836	.305	.171

Note: [a] Private School = 1, State School = 0; [b] Male = 1, Female = 0; [c] Pearson correlation:
* $p < 0.05$; ** $p < 0.01$.

All of the partitions include a set of items for which a Reliability Analysis produced a Cronbach Alpha or .60 or more, save only for Future Negative, most likely because it had only three items, which tends to artificially reduce the value of the index.

CONCLUSIONS

It seems that the 42 items chosen out of the original 69 of the ZTPI-C show an overall structure in accordance with what would be expected from the underlying theory on the subject of the perception of time (construct validity), with reasonable reliability. It also was able to assess nuances of the developmental process for this type of perception, besides providing insights into the roles of gender and type of education. One concludes, therefore, that this reduced version of the scale is adequate, at least for research purposes, in Brazil.

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APPENDIX

Zimbardo Time Perspective Inventory for Children, ZTPI-C Brazilian Version

Instructions:

Read each sentence below and draw a X in the " face " that represents the extent to which each phrase seems like or not of what you to do or like .				
				
Seems nothing like me	Doesn't seem like me	Neutral	Seems to me	seems like me a lot

Item in Brazilian Portuguese	Translation
01-Sair com os amigos é uma das coisas mais divertidas da vida. (PH)	01-Hanging out with friends is one of the most fun things in life. (PH)
02-Imagens, sons e cheiros de quando eu era pequeno trazem muitas lembranças maravilhosas. (PP)	02-Images, sounds, and smells of when I was younger bring me many wonderful memories. (PP)
03-Acredito que o destino decide a maior parte da minha vida. (PF)	03-I think fate guides many things in my life. (PF)
04-Sempre penso em coisas que poderia ter feito diferente em minha vida. (PN)	04- I often think of things in my life that I could have done differently. (PN)
05-Já decidi o que vou ser quando crescer. (FP)	05-I already know what I'm going to be when I grow up. (FP)
06-Acho que é legal pensar no que vai fazer um dia antes. (FP)	06-I think it's cool to think about what I'm going to do the day before. (FP)
07-O que faço com meu tempo está bom. (FP)	07-(new) What I do with my time is fine. (FP)
08-Tenho uma ideia do que vou fazer depois das férias. (FP)	08-I have an idea of what I will do after vacation. (FP)
09-Penso sobre as coisas boas que deixei de fazer. (PN)	09-I think about the good things that I didn´t do.
10-Quando quero conseguir algo, penso como conseguir e procuro fazer cada parte. (FP)	10-When I want to attain something, I think of how to do it and try to do each part. (FP)
11-Faço as coisas sem pensar. (PH)	11-I do things without thinking. (PH)
12-Na minha vida pessoal tenho planos para vários anos. (FP)	12- In my personal life I have plans for several years. (FP)
13-Em geral, tem muito mais coisas boas do que ruins no meu passado. (PP)	13-In general, there are much more good things than bad ones in my past. (PP)
14-Não vejo o tempo passar quando estou ouvindo minha música preferida. (PH)	14-I do not see time go by when I'm listening to my favorite music. (PH)
15-Muitas vezes acho que não terei tempo para fazer tudo que eu queria fazer no dia. (FN)	15-I often think that I do not have time for everything I wanted to do in one day. (FN)
16-As tarefas para o próximo dia e outros trabalhos importantes devem vir antes da diversão de hoje à noite. (FP)	16-The tasks for the next day and other important work must come before tonight's play. (FP)
17-Não importa o que eu faça, que o que tiver de acontecer vai acontecer. (PF)	17-No matter what I do, what has to happen will happen. (PF)
18-Gosto de estórias que me fazem imaginar como eram os tempos antigos. (PP)	18-I like stories that make me imagine how things were a long time ago. (PP)
19-Sempre me lembro de coisas ruins que aconteceram comigo. (PN)	19-I always remember the bad things that happened to me. (PN)

20-Fico chateado quando estou atrasado para algum compromisso. (FP)	20-I get upset when I'm late for appointments. (FP)
21-Se pudesse, eu viveria cada dia como se fosse o último. (PH)	21-If I could, I would live each day as if it were my last one. (PH)
22-Boas lembranças de coisas do passado surgem facilmente na minha mente. (PP)	22- Good memories of things in the past easily pop into my mind. (PP)
23-Penso que já sofri muito quando era menor e que não suportaria sofrer mais. (PN)	23- I think I have suffered a lot when I was younger and could not bear to suffer more. (PN)
24-No meu dia faço o que vier, sem tentar planejar. (FP reverse)	24-In my day I do whatever comes up, without trying to plan it. (FP reverse)
25-Já aconteceram muitas coisas ruins comigo, por isto prefiro não pensar sobre o meu passado. (PP reverse)	25-Many bad things have already happened to me, so I prefer not to think about my past. (PP reverse)
26-Gosto de aventuras, coisas novas e sair da rotina. (PH)	26-I like adventures, new things, and getting out of the routine. (PH)
27-Geralmente não sei como vou dar conta de fazer as coisas que quero no futuro. (FN)	27-I usually don't know how I will be able to do the things I want to do in the future. (FN)
28-Fiz coisas quando era menor que se pudesse voltar no tempo não faria de novo. (PN)	28-I did things when I was younger that, if I could go back in time, I would not do again. (PN).
29-É mais importante aproveitar o que estou fazendo do que fazer o trabalho no tempo marcado. (PH)	29-It's more important to enjoy what I am doing than to get work done on time (PH).
30-Ao tomar uma decisão considero o que pode acontecer de bom ou ruim. (F)	30-Before making a decision I consider what the good or bad things that can happen are. (F)
31-Assumir riscos evita que minha vida seja chata. (PH)	31-Taking risks keeps my life from becoming boring. (PH)
32-E mais importante para mim, curtir a vida do que pensar no futuro. (PH)	32-It's more important to me to enjoy life than to think about the future.(PH)
33-É difícil para eu esquecer coisas desagradáveis que me aconteceram. (PN)	33- It is difficult for me to forget unpleasant things that happened to me. (PN)
34-Mesmo quando estou aproveitando o presente, lembro de situações parecidas no passado. (PN)	34-Even when I'm enjoying the present, I remember similar situations in the past. (PN)
35-Não gosto de planejar o futuro porque as coisas podem mudar. (PF)	35- I do not like to plan ahead because things can change. (PF)
36-As coisas da minha vida são controladas por forças que eu não posso mudar. (PF)	36-Things in my life are controlled by forces I cannot change. (PF)
37-Não adianta ficar pensando no amanhã se não posso fazer muita coisa pra muda-lo. (PF)	37-There is no point in thinking about tomorrow if I cannot do much to change it. (PF)
38-Termino minhas tarefas no tempo certo. (F)	38-I complete my tasks on time. (F)
39-Eu me arrisco para ter emoção na minha vida. (PH)	39-I take risks so to put excitement in my life. (PH)
40-À noite fico pensando nos desafios e como vai ser o dia de amanhã. (FN)	40- At night I think on the challenges and on how tomorrow will be. (FN)
41-Faço lista das coisas que tenho para fazer. (FP)	41-I make lists of things I have to do. (FP)
42-Costumo seguir mais meu coração que minha cabeça. (PH)	42-I often follow my heart more than my head. (PH)
43-Resisto a diversão quando sei que tenho obrigações a fazer.(FP)	43-I resist the fun when I know I have chores to do. (FP)
44-Eu não penso nas consequências antes de fazer as coisas. (PH)	44- I do not think on the consequences before doing things. (PH)
45-Penso nas coisas ruins que aconteceram comigo no passado. (PN)	45- I think of the bad things that happened to me in the past. (PN)
46. Eu fico emocionado com as coisas que acontecem comigo. (PH)	46- I get emotional about things that happen to me . (PH)
47-Sempre terei tempo para fazer minhas tarefas no tempo certo. (FP) reverse	47-I will always have time to do my chores on time. (FP) reverse
48-A vida de hoje é muito complicada, prefiro a vida mais simples de antigamente. (PN)	48-Life today is too complicated; I would prefer the simpler life of the past. (PN)

49-Gastar agora o que tenho com coisas que me divertem é melhor que guardar para amanhã. (PF)	49-Spending what I earn on pleasures today is better than saving for tomorrow. (PF)
50-Acho que muitas coisas na vida acontecem por um motivo. (PF)	50-I think many things in life happen for a reason. (PF)
51-Não é possível contar com a sorte, o melhor é fazer por merecer. (FP)	51-You can't count on luck, it is best to deserve things. (FP)
52-Gosto de lembrar quando eu era mais novo. (PP)	52-I like to remember when I was younger. (PP)
53-Muitas vezes acho que não vou dar conta de cumprir minhas obrigações com amigos, pais e professores. (F**N**)	53-I often feel that I will not be able to fulfill my duties with friends, parents and teachers. (FN)
54-Faço minhas obrigações tanto com amigos quanto com pais e professores. (FP)	54-I do my duties with friends, parents and teachers on time. (FP)
55-Se as coisas não são feitas a tempo, não me preocupo. (FP) reverse	55-If things don't get done on time, I don't worry about it (FP reverse)
56-Quando tenho de tomar uma decisão rápida, fico preocupado se tomei a decisão errada. (FN)	56-When I have to make a quick decision, I worry if I made the wrong one. (FN)
57-Sinto muita saudade de quando eu era menor. (PP)	57-I miss the time when I was younger.(PP)
58-As coisas raramente acontecem como eu espero. (PN)	58-Things rarely happen as I hope it will.(PN)
59-Eu me sinto sufocado quando me pressionam por não ter feito coisas no tempo certo. (FN)	59-I feel smothered when I'm pressured for not finishing the tasks on time. (FN)
60-Gosto de tradições que acontecem na minha família. (PP)	60-I like the traditions that happen in my family.
61-Pensar sobre o meu futuro me deixa triste. (FN)	61- Thinking about my future makes me sad.(FN)
62-O futuro tem muitas decisões chatas que eu não quero pensar a respeito. (FN)	62- There are many boring decisions in the future that I do not want to think about. (FN)
63-Tento viver o máximo, um dia de cada vez. (PH)	63- I try to live my life as fully as possible, one day at a time. (PH)
64-Gosto que meus amigos sejam bem próximos. (PH)	64-I like my friends to be very close. (PH)
65-Eu não dou atenção quando pessoas da minha família falam coisas do passado, de como era diferente na época deles. (PP reverse)	65-I pay no attention when family members talk about the way things used to be. (PP reverse) (Double negative)
66-A maioria das minhas decisões é influenciada por pessoas e coisas que estão a minha volta. (PN)	66-My decisions are mostly influenced by people and things around me. (PN)
67-Muitas vezes a sorte funciona melhor do que o trabalho duro. (PF)	67-Often luck works better than hard work. (PF)
68-Eu continuo fazendo coisas difíceis chatas se sei que será bom para mim no futuro. (FP)	68-I keep doing difficult and boring things if I know they will be good for me in the future. (FP)
69-Fico desanimado em fazer minhas atividades se tenho que pensar em objetivos. (PF)	69-I am discouraged to do my activities when I have to think of goals. (PF)