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Iven Van Mechelen, Hans-Hermann Bock, Paul De Boeck

Institutions: Katholieke Universiteit Leuven, RWTH Aachen University

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A royal road to understanding the mechanisms underlying person-in-context behavior

Iven Van Mechelen *

Psychology Department, Tiensestraat 102 – Box 3713, B-3000 Leuven, Belgium

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ABSTRACT

The structure of individual differences in behavioral profiles across situations constitutes a royal road to understanding the mechanisms underlying person-in-context behavior. I want to go beyond partial accounts of this structure in terms of cross-situational consistency coefficients and estimated percentages of variance accounted for by person–situation interactions. For this purpose I propose a small set of empirically testable questions that underlie a basic typology of contextualized individual differences structures. The answers to these questions and the resulting classes of the typology relate to a broad range of concepts and theoretical frameworks, including synergistic interactions, ability accounts of personality dispositions, stress-diathesis models within the psychopathology domain, individual differences in discriminative facility, and Traits As Situational Sensitivities models. Tools from the two-mode clustering domain (old as well as recently proposed ones) can be used to detect the type of individual differences structure that constitutes the gist of a person by situation data set at hand. I illustrate with data on individual differences in helping behavior in a set of emergency situations.

1. Introduction and problem

Personality psychology essentially deals with the study of individual differences in behavior. Perhaps the most central message in Mischel's (1968) seminal book is the importance of explicitly including situations in the assessment of personality. Today, this challenge is being addressed in the broad research domain of contextualized personality psychology (Mischel, 2004; Roberts, 2007).

A key concept within contextualized personality psychology is that of a behavioral signature (Mischel & Shoda, 1995; Mischel, Shoda, & Ayduk, 2008), that is, the profile that represents the intensity (or conditional probability of occurrence) of some behavior as displayed by some individual in different situations. Such behavioral signatures appear to be relatively stable across time and distinctive of a particular individual or a particular type of persons.

It is of central importance to contextualized personality psychology that a better insight is acquired into the mechanisms underlying behavioral signatures. A first possibility to arrive at such an insight consists of postulating various kinds of constructs related to underlying mechanisms and processes, and to subsequently investigate the relationship between behavioral signatures and measures of such constructs (as external variables). One may wish to investigate, for example, the relationship between signatures of aggressive behavior and measures of capability of frustration tolerance or measures of hostile attribution.

In this paper I start from the claim that there is a second way to arrive at a better insight into the mechanisms underlying person-in-context behavior. This second way pertains to studying the bare structure of individual differences in behavioral signatures, *without* relying on measures of constructs related to underlying mechanisms and processes. For example, one may study the structure of individual differences in profiles of aggressive behavior across situations, without relying on measures of capability of frustration tolerance, hostile attribution, feelings of anger, etc. A major reason for proceeding in this way is that the bare structure of behavioral signatures necessarily constitutes the mould of any subsequent account of the dynamics underlying person-in-context behavior. Logically speaking, accounts that do not fit in with the mould implied by the structure of the ultimate target of interest simply cannot be correct.

Our claim does *not* read that the second possible way to arrive at a better insight into the mechanisms underlying person-in-context behavior should replace the first one. Rather, the two ways are complementary and not opposites, with the insights obtained from the second way to be related in a next stage to process variables studied in the first way. It is our claim, however, that the second way should be considered a fully fledged alternative (and perhaps even a "royal road") to trace the mechanisms underlying person-in-context behavior. For too long, this alternative has been overlooked. The most important reason for this is that up till now structural

* Fax: +32 16 325993.
E-mail address: Iven.VanMechelen@psy.kuleuven.be

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personality research has been primarily devoted to decontextualized individual differences in behavior; within contextualized personality psychology, structural research has further been largely limited to variance component estimates (see e.g., Furnham & Jaspars, 1983) and estimates of cross-situational consistency.

When trying to capture the structure of individual differences in behavioral signatures, I want to move beyond partial accounts in terms of cross-situational consistency coefficients and estimated percentages of variance accounted for by person–situation interactions. Rather, I want to draw distinctions between several major patterns of contextualized individual differences structures. For this purpose, I will first outline a small set of empirically testable questions that may act as guiding tools in drawing such distinctions (Section 2). Subsequently, I will show how different patterns of answers to these questions give rise to a wealth of contextualized individual differences structures, which further appear to relate to a broad range of concepts and theoretical frameworks within the personality domain (Section 3); as such, the basic questions and their implied taxonomy of individual differences structures are shown to act as a powerful integrating conceptual framework. Section 4 will deal with the question of how to retrieve the structure of contextualized individual differences from empirical data. In Section 5, I will present two concluding remarks.

2. Basic questions

Throughout this paper I assume that data are available on the intensity of a single behavior, for a number of persons in a number of situations. These data could be obtained by means of ratings from trained observers or by any other means. The resulting behavioral signatures then can be represented as in Fig. 1.

Note that each point in Fig. 1 may represent either a single measurement or an aggregate across multiple measurement occasions for the same person–situation (type) combination under study. [The possible use of aggregate scores can be linked to conceptual-methodological questions on the appropriateness and (dis)advantages of aggregation (Epstein, 1983); although to some this may come as a surprise, such questions, indeed, also show up *within* contextualized approaches to personality].

A psychological interpretation of behavioral signatures requires the addition of psychological content, with respect to the behavior under study and in particular with respect to the situations. Mischel and Shoda (1995) convincingly argued that a characterization of situations should be achieved in terms of active psychological features rather than in terms of mere nominal references to the locations of the situational settings. The behavior as displayed in Fig. 1 could, for example, be thought of as verbal aggression, and the situations as "failure in a competition" (S_1), "argument with a peer" (S_2), and "public insult" (S_3).

From a formal point of view, it is important to emphasize that, prior to any analysis, the individual persons and situations as displayed in Fig. 1 are to be considered values of two nominal variables. This, for instance, also implies that their rank order is arbitrary (which, from an orthodox point of view, would mean that one could even dispute the use of line diagrams to represent the signatures).

I now turn to a discussion of four questions that will be most useful in drawing a distinction between different basic structures of contextualized individual differences in behavior. To clarify these questions, I will repeatedly make use of hypothetical examples as the one represented in Fig. 1. This could perhaps be misleading, in that the reader might think that the structures that are implied by the answers to the questions to be outlined below are far too simple to be useful in real data that involve large numbers of persons and/or situations. When dealing with empirical data of realistic sizes, however, our goal will be to capture the core structure that constitutes the gist of such data; incidental fluctuations and minor departures from the core structures will be ignored. Answers to the questions to be discussed below then will act as important anchor points to capture the core structures in question (see further Section 4).

2.1. Question 1: is the rank order of the situations preserved across persons?

The behavioral signature of each person implies a rank order of the situations (possibly with ties) in terms of elicited behavioral intensity. The first question reads as to whether this rank order is consistent across persons. Formulated in a slightly more accurate way, this comes down to whether the situations can be ranked in such a way that the behavioral signatures of all persons under study are nondecreasing. An example in which this is the case is presented in Fig. 2.

If the condition of rank order consistency across persons of the situations is satisfied, the rank order of the situations on the horizontal axis of figures such as Fig. 1 is no longer arbitrary. With regard to the substantive mechanism underlying the behavioral signatures, the consistent rank order of the situations suggests the existence of a latent (excitatory or inhibitory) force that stems from the situations and that plays a key role in the coming about of the behavior for all persons. In this regard, situations taking a higher position on the situation dimension imply more excitatory (or less inhibitory) situational strength. Within the aggression domain, for example, situational strength could be associated with the excitatory force of amount of frustration as induced by the situation, or with the inhibitory force of amount of social control in the situations under study.

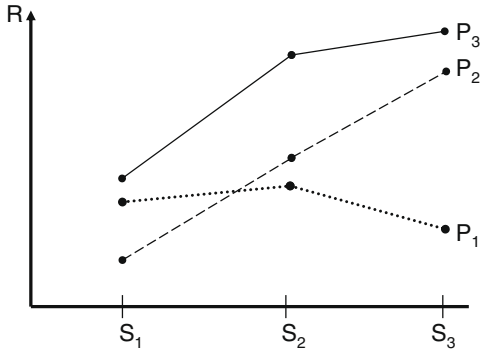

Fig. 1. Hypothetical behavioral signatures of three persons.

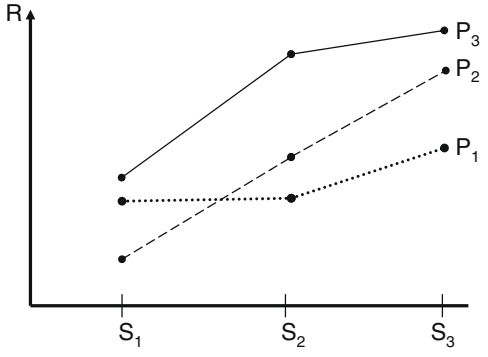

Fig. 2. Hypothetical behavioral signatures of three persons with the rank order of the situations being preserved across persons.

Technically speaking, consistency of the rank order of situations across persons implies the possibility of a one-dimensional representation of the situations. Violations of the consistency condition point at the need for a multidimensional representation.

2.2. Question 2: is the rank order of the persons preserved across situations?

Question 2 is the person counterpart of Question 1: is the rank order of the persons (possibly with ties), in terms of elicited behavioral intensity within each situation, consistent across situations? This can be looked at as a question about generalized cross-situational consistency, with the differences with classical cross-situational consistency (as captured by cross-situational correlation coefficients) being that only the rank order of the persons is taken into account and that ties are allowed. An example in which the condition of generalized cross-situational consistency is satisfied (with in all situations $P_1 \leqslant P_2 \leqslant P_3$) is presented in Fig. 3.

In cases like this one, the rank order of the persons is no longer arbitrary; therefore, Fig. 3 implies a one-dimensional representation of the persons, with Person P_3 taking the higher and Person P_1 taking the lower position on the dimension in question. With regard to the substantive mechanism underlying the behavioral signatures, one may now think of a latent (excitatory or inhibitory) force stemming from the persons that plays a key role in the coming about of behavior. Take as an example again the aggression domain. If the person force would be of an inhibitory nature (e.g., frustration tolerance), higher positions on the latent person dimension would be associated with weakness (viz., a low level of frustration tolerance), and lower positions with strength. Conversely, however, if the person force would be of an excitatory nature (e.g., assertive ability) higher positions on the latent person dimension would be associated with strength, and lower positions with weakness. Insofar the nature of the person force under study (excitatory vs. inhibitory) is ambiguous, the issue of whether a certain pole of the person dimension is considered strength or weakness is "in the eye of the beholder".

Technically speaking, generalized cross-situational consistency implies the possibility of a one-dimensional representation of the persons, by analogy to the case of rank order consistency of the situations. Again, violations of generalized cross-situational consistency point at the need for a multidimensional representation.

2.3. Question 3: do situations differ in implied individual differences variance?

The third and fourth questions pertain to differences in variance. To start with the third question, one may inspect the amount of individual differences variance within each situation. One then may wonder whether situations differ in their implied individual differences variance. Fig. 4 presents an example in which this is the case, with Situation S_2 implying a much smaller amount of individual differences variance as compared to the two other situations. Within an aggression context this could, for instance, be due to the presence of a larger amount of social control in Situation S_2. The individual differences variance as implied by a situation can be immediately linked to concepts such as situational ambiguity and situational constraint level (e.g., Price & Bouffard, 1974), which has been exemplified above in terms of level of social control.

2.4. Question 4: do persons differ in implied situational differences variance?

Question 4 is the person counterpart of Question 3: do individuals differ in their behavioral variance across situations? Fig. 5 presents an example in which this is the case, with Person P_1 displaying a much smaller amount of situational differences variance as compared to the two other persons. Within an aggression context, this could, for instance, be due to physical weakness of Person P_1. Individual differences in behavioral variance across situations can be linked to the concept of individual differences in discriminative facility, that is, individual differences in sensitivity to changing situational cues in terms of flexible and adaptive cross-situational behavioral variability (Cheng, 2003; Mischel, 1973).

3. Structures of contextualized individual differences and their relationship with personality concepts and models

The answers to the four questions are independent in that the answer to each question does not imply information for the answer to any of the three other ones. The issue whether the rank order of situations is consistent across persons is unrelated, for example, to the issue of generalized cross-situational consistency of within-situation individual differences. This is illustrated by the fact that the sets of hypothetical behavioral signatures as represented in Figs. 2 and 3 each exemplify one of the two types of consistency but not the other. This implies, moreover, that the dimensionality of situations may differ from the dimensionality of persons (e.g., one of the two may be one-dimensional whereas the other is multidimensional, or vice versa). To some this might come as a surprise, because in a number of well-known formal dimensional models for two-way two-mode data (such as the principal components model), the dimensionalities of the two modes as included in the data are constrained to be of equal complexity.

One should consider the responses to the four questions together. Each pattern of responses gives rise to a distinct structure of individual differences in contextualized personality. These

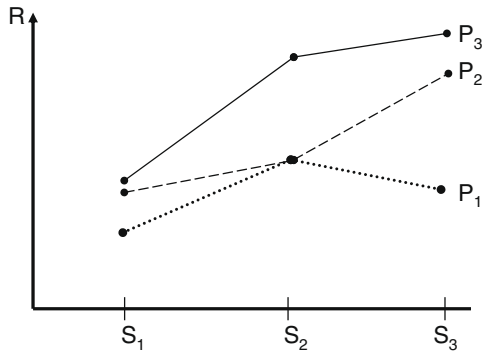

Fig. 3. Hypothetical behavioral signatures of three persons with the rank order of the persons being preserved across situations.

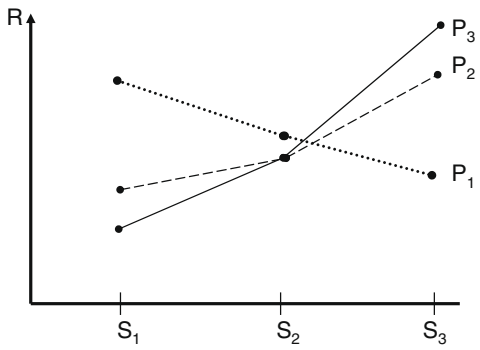

Fig. 4. Hypothetical behavioral signatures of three persons with differences between situations in implied individual differences variance.

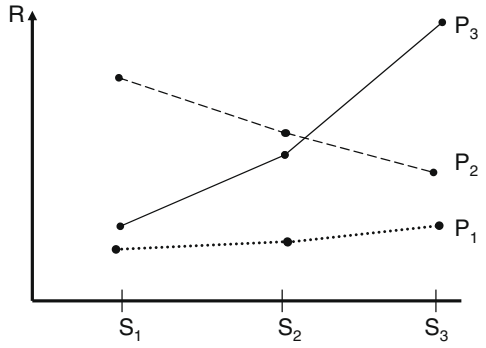

Fig. 5. Hypothetical behavioral signatures of three persons with individual differences in implied situational differences variance.

structures of individual differences bear intriguing relations with a broad range of concepts and models within the personality domain. Below, I will illustrate this with various examples.

3.1. Synergistic person by situation interactions

Considering the responses to the first two questions together gives rise to a two by two taxonomy of contextualized individual differences structures depending on whether consistency is preserved or not across persons and across situations. Note that this taxonomy links up with the distinctions between single and double monotonicity, and between (single and double) ordinal and disordinal interactions within data-analytic and psychometric writings (see, e.g., Mokken & Lewis, 1982).

An interesting cell within the two by two taxonomy as outlined above is the double monotonic one, in which the rank order of both situations and persons is consistent across the elements of the other mode. An hypothetical example of this can be found in Fig. 6.

Some authors have referred to structures as the one represented in Fig. 6 as *synergistic* person by situation interactions (see, e.g., Schmitt, Eid, & Maes, 2003). One should note, however, that the structure displayed in Fig. 6 results from a particular type of compound of two main effects and an interaction, rather than from an interaction only. Furthermore, the conceptual analysis of Questions 1 and 2 in the previous section may lead to a substantive interpretation of the mechanism underlying Fig. 6 in terms of situation- and person-bound forces. The same analysis, however, also suggests that whether the situation- and person-bound forces are to be looked at as competing or synergistic may depend on whether each of the two forces is considered to be excitatory or inhibitory in nature. More in particular, if both forces were of the same nature, the interaction would be synergistic, and if not, it would be competitive. Take the example of helping behavior or altruism. If this behavior were to result from the interplay of *costs of helping* (an inhibitory situation force) and *prosocial motivation of the potential helper* (an excitatory person force) (Graziano, Habashi, Sheese, & Tobin, 2007), Fig. 6 would represent a competitive interaction. If the same behavior, however, were to result from the interplay of *need amount of the victim* (an excitatory situation force) and *capacity for empathy of the potential helper* (an excitatory person force), Fig. 6 would represent a "true" synergistic interaction.

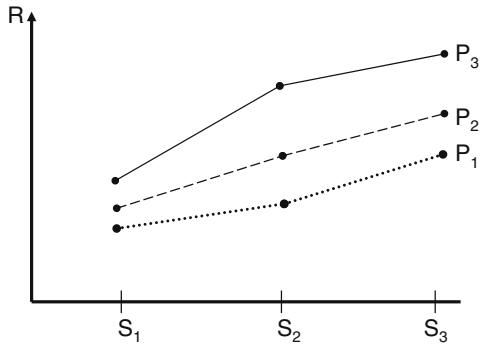

Fig. 6. Hypothetical behavioral signatures of three persons which are such that the rank order of both situations and persons is consistent across the elements of the other mode.

3.2. Ability models of personality

The double monotonic structure in Fig. 6 also immediately fits in with ability models of personality (see e.g., Wallace, 1966; Wright & Mischel, 1987). Such models imply a competitive interaction between situational demand and person competency levels. In case of success behaviors, situational demand would be considered an inhibitory force and person competency an excitatory force. For failure behaviors, on the other hand, it would be the other way around. For example, if the behavior under study were aggression, one possibility could be to consider this a failure behavior that results from a lack of frustration tolerance; this fits in with a competitive interaction between amount of frustration induced by the situation (situational demand, which acts here as an excitatory situation force) and frustration tolerance of the person (person level of competency, which acts here as an inhibitory person force). Still another possibility could be to consider aggression a success behavior that results from a high level of assertiveness; this fits in with a competitive interaction between amount of curtailment in the situation (which acts as an inhibitory situation force) and assertiveness of the person (an ability that acts as an excitatory person force).

Notably, ability models of personality (and their associated contextualized individual differences structures) bear close relations both with similar models in the cognitive domain and with standard psychometric models that include difficulty parameters for items (situations) and ability parameters for persons.

3.3. Stress-diathesis models

So-called stress-diathesis models in the psychopathology domain constitute another instance of the formal structure in Fig. 6. These models have been proposed for disorders such as depression and schizophrenia (see, e.g., Fowles, 1992; Monroe & Simons, 1991). They imply a competitive interaction between an excitatory situation force (viz., the amount of situational stress) and an inhibitory person force (with a low level of person force referred to as vulnerability or diathesis); psychopathology then comes down to a failure of the person in the competition with the situation.

3.4. Situational ambiguity

If the answers to the first and third questions are both positive, that is, if the situations under study can be consistently rank-ordered according to their eliciting force, and if they differ in constraint level (or implied individual differences variance), one may further wonder whether the dimensions of situational force and situational constraint level are interrelated. Fig. 7 gives two hypothetical examples in which this is the case, with panel (a) of this figure representing a monotonic increasing relationship between force and amount of individual differences (i.e., the rightmost situations on the situation dimension give rise to the largest individual differences variance); in panel (b) the relationship is curvilinear rather (with more sizeable individual differences showing up in situations that take an intermediate position on the situational

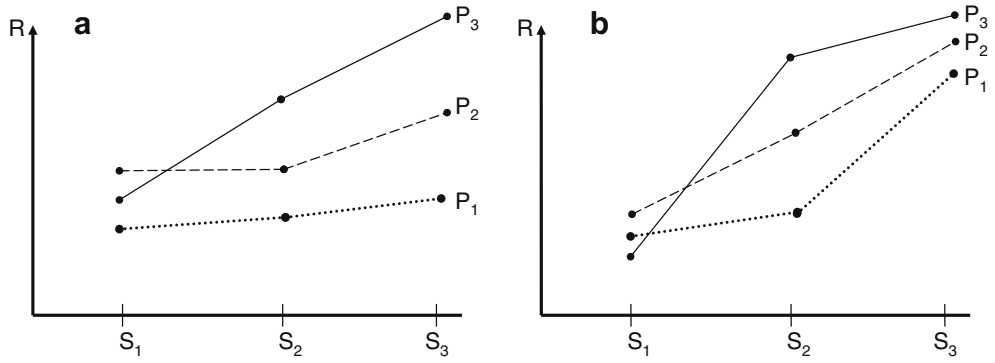

Fig. 7. Hypothetical behavioral signatures of three persons with the rank order of the situations being preserved across persons, and with (a) a monotonic increasing and (b) a curvilinear relationship between situational force and situational constraint level.

force dimension). A natural interpretation for the latter type of structure reads that ambiguity with regard to situational force gives rise to more sizeable individual differences.

3.5. Process basis of individual differences in discriminative facility

If the answers to the second and fourth questions are both positive, that is to say, if the persons under study can be consistently rank ordered in terms of person strength, and if they differ in discriminative facility, one may further wonder whether person strength and discriminative facility are interrelated. Fig. 8 gives a hypothetical example that represents a monotonic relationship between both. In case the person dimension corresponds to an excitatory force, this figure implies that stronger persons are also higher in discriminative facility.

Interestingly, the relationship between person strength and discriminative facility can be most relevant in distinguishing between two possible process accounts of individual differences in discriminative facility. According to a first possible explanation, a lack of discriminative facility could be attributed to a lack of perceptual ability, and more in particular a lack at the level of perception of differences between situations in situational cues and demands. According to an alternative explanation, however, a lack of discriminative facility is not to be attributed to a perceptual deficit, but rather to a deficit at the competence level, that is, a deficit in translating correctly perceived situational demands into situationally adjusted behavior (Shoda, Mischel, & Wright, 1994). (Note that the distinction between the two types of explanations may be fairly consequential when looking for suitable remedies, in that a perceptual deficit may call for interventions that differ rather considerably from interventions aimed at a correction of deficits at a behavioral competence level.) In case of a monotonic relationship between person force and discriminative facility (such as in Fig. 8), and with stronger persons being higher in discriminative facility, a competence-based explanation is the most parsimonious option to account for lower levels of discriminative facility. In that way a single underlying person competence would suffice to account for the whole of the structure of contextualized individual differences.

3.6. Conjunctive combination of person and situation requisites

A special case of the structure as discussed in the previous section arises when: (a) the rank order of the situations is preserved across persons, (b) the rank order of the persons is preserved across situations, (c) situational force is monotonically related to situational constraint level, with absence of individual differences at the lower bound of the situational dimension, and (d) person force is monotonically related to discriminative facility, with absence of discrimination between situations at the lower bound of the person dimension. An example if such a structure is displayed in Fig. 9.

In this figure: (a) all behavioral signatures are nondecreasing; (b) generalized cross-situational consistency is satisfied, in that in all situations $P_1 \leqslant P_2 \leqslant P_3$; (c) the fan pattern of the signatures implies increasing sizes of situation-specific individual differences variances with increasing values on the situation dimension; moreover all signatures coincide in Situation S_1 (i.e., the individual differences variance in this situation equals zero); (d) the signature

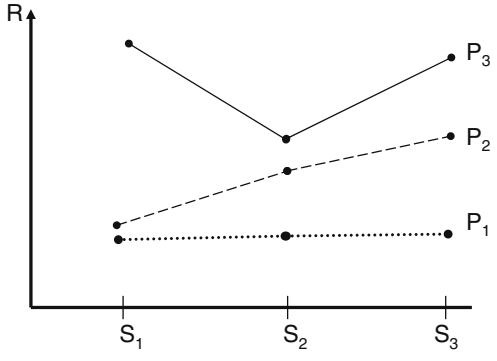

Fig. 8. Hypothetical behavioral signatures of three persons with the rank order of the persons being preserved across situations, and with a monotonic relationship between person force and discriminative facility.

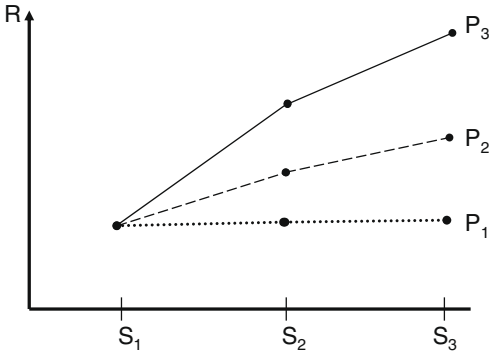

Fig. 9. Hypothetical behavioral signatures of three persons with (a) the rank order of the situations being preserved across persons, (b) the rank order of the persons being preserved across situations, (c) a monotonic relationship between situational force and situational constraint level (with absence of individual differences at the lower bound of the situational dimension), and (d) a monotonic relationship between person force and discriminative facility (with absence of discrimination between situations at the lower bound of the person dimension).

of persons taking higher positions on the person dimension has a steeper slope (which implies a stronger discriminative facility); moreover the lowermost person on the person dimension has a horizontal signature (which implies absence of any discrimination between situations).

The structure as illustrated in Fig. 9 is typically associated with a conjunctive mechanism underlying behavioral intensity. For example, one may hypothesize a problematic behavior (e.g., drug abuse) to occur only if *both* the person under study scores high on vulnerability or diathesis *and* the situation under study takes a high value on a dimension of stress.

3.7. Generalized trait models

The study of contextualized individual differences is not at odds with dispositional, trait-based accounts of personality. Historically speaking, trait research has sometimes been driven by the assumption of uniformly high cross-situational consistency correlation coefficients. Generalized trait models can be considered, however, in addition to such simplifying accounts. A key assumption in those models is that of generalized cross-situational consistency, that is, a positive answer to Question 2 or preservation of the rank order of the persons, possibly with ties, in terms of elicited behavioral intensity across situations.

In generalized trait models, differences between situations in terms of situation-bound individual differences variances can further be attributed to situational differences in *trait relevance* (Tett & Guterman, 2000). The structure as depicted in Fig. 10, for example, corresponds to the predictions of one particular instance of the class of generalized trait models, namely the *Traits as Situational Sensitivities* model (Marshall & Brown, 2006); the latter model suggests that traits (e.g., trait aggressiveness) will be most apparent in situations of moderate strength (e.g., moderate provocation).

To be sure, traits will generally only provide descriptive summaries (rather than causal or process-based explanations) of structures such as the one represented in Fig. 10. Moreover, most (generalized) trait models do not include an explicit prediction about which situational characteristic(s) will relate to more sizeable situation-bound individual differences.

4. Retrieving the structure of contextualized individual differences from empirical data

4.1. Conceptual issues

The answers to the four questions as outlined above will depend on the nature of the data under study, that is to say, the type of behavior, the population/sample of individuals, and the nature and scope of the situations. The occurrence of between-situation differences in within-situation individual differences variance may, for example, depend on the presence of ambiguous as well as unambiguous situations in the set of situations under study. As a second example, from panel (b) of Fig. 7 one may derive that whether the relationship between situational force and situational constraint level is monotonic increasing, monotonic decreasing, or curvilinear fully depends on the range of the situations under study (as limiting this panel to the two leftmost situations would yield a monotonic increasing relation and limiting it to the two rightmost situations a monotonic decreasing one).

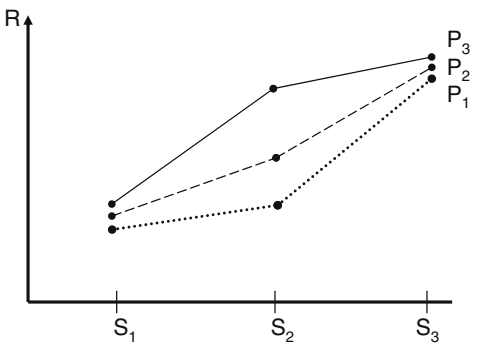

Fig. 10. Contextualized individual differences structure as implied by the Traits As Situational Sensitivities model.

Second, the four guiding questions pertain to consistency of rank orders and constancy of variances. It is easy to see that violations of such a consistency and constancy may be caused by single outlying person–situation combinations. At this point it becomes important to take into account both the possible occurrence of measurement errors and the fact that, with higher numbers of persons and/or situations, the occurrence of violations of consistency and constancy become most likely. Because of the first reason, one may wish to look for answers to the guiding questions at the level of the underlying true scores of behavioral intensity rather than at the level of the observed scores that are prone to error; estimates of such true scores could be obtained through various kinds of modeling techniques. Because of the second reason, one may further wish to characterize primarily the contextualized individual differences structure that constitutes the gist of a data set at hand, and disregard minor departures from consistency and constancy as implied by small fluctuations in the data.

4.2. Methods

Several types of methods could be considered to look for a response to the four questions as outlined above, on the basis of a data set on the behavioral intensity for a single behavior of a number of persons in a number of situations. In case of a priori hypotheses on the nature of the individual differences structure (e.g., in terms of a particular combination of person and situation main effects and/or a person by situation interaction that involve a small number of prespecified person and situation types), analysis of variance (in conjunction with suitable contrast tests) is an obvious choice.

The use of some data-reduction technique (or some type of modeling that implies a data reduction) may be needed, in absence of strong hypotheses on the structure of contextualized individual differences in terms of prespecified person and situation types. Such a data reduction may contribute to removing noise and minor particularities and to unveiling the gist of the data at hand. Our guiding questions and the diagnosis of the implied person-in-context structure then can be dealt with on the level of the reduced or reconstructed data.

A simultaneous reduction of both persons and situations may be desirable, especially if the data pertain to larger numbers of persons and/or situations). To achieve such a simultaneous reduction, it may be most useful to rely on two-mode clustering methods, that is, methods that imply a simultaneous clustering of persons and situations. A broad range of such methods is available (for a comprehensive overview, see Van Mechelen, Bock, & De Boeck, 2004). For the type of data under discussion in the present paper, the methods may simultaneously identify clusters of functionally equivalent situations, and types of persons with very similar behavioral signatures; the structure of the reduced signatures of the person types across the situation clusters may further imply answers to the four guiding questions as outlined at the beginning of this paper.

The majority of two-mode clustering methods that are suitable for the analysis of person by situation data on behavior is exploratory in nature. However, in a number of cases one may wish to investigate prespecified types of contextualized individual differences structures in a more confirmatory way. The use of

constrained models could be most helpful for this purpose. Especially promising in this regard is the development of a data-analytic strategy (based on constrained simultaneous clustering models) that enables one to assess several types of interaction in two-way data (Schepers & Van Mechelen, submitted for publication), without any need to prespecify potentially relevant (situation or person) features or a priori (situation or person) orderings.

Finally, the output of the data-analytic methods as mentioned above, the answers to our four guiding questions, and the diagnosis of the implied person-in-context structure are to be situated at a formal level. One may wish to supplement these results with substantive psychological interpretations, for example, in terms of a characterization of situation clusters or of situation dimensions (or forces) in terms of active psychological features. Shoda and LeeTiernan (2002) proposed several methods that could be most useful for this purpose. Those include approaches for feature identification drawn on personal construct theory, feature applicability ratings of situations by participants and expert judges, and data-analytic methods to assess the sensitivity of behavioral signatures to situation features. Most of the methods proposed by Shoda and LeeTiernan could also be used in conjunction with the data-reduction methods as proposed above. The major difference with the original Shoda and LeeTiernan approach is that, in our case, the substantive interpretation aims at the reduced data (i.e., situation clusters rather than individual situations, behavioral signatures of person types rather than single individuals etc.). A data reduction may significantly facilitate a subsequent substantive psychological interpretation in case of data with larger numbers of persons and/or situations.

4.3. Illustrative application

We will illustrate the above with an application on contextualized individual differences in altruism. The data were collected from a group of 102 students. The students rated an experimental list of 16 descriptions of everyday emergency situations with respect to the extent they would be willing to help the victim in it. For this purpose they were given a rating scale ranging from 0 (definitely not) through 6 (definitely yes). Examples of (abbreviated) situation descriptions include: "In a very crowded grocery store you see a little boy, weeping and crying for his mum"; "In a busy shopping street, you pass by a beggar woman and her children who hold a sign that they need money to buy food"; "When waiting in a line for a phone booth you are asked by a very nervous stranger whether you could give him priority."

The resulting 102 by 16 rating data matrix was subjected to HICLAS-R analyses. HICLAS-R (Van Mechelen, Lombardi, & Ceulemans, 2007) is a two-mode clustering method especially designed for the analysis of matrices with rating-valued data. It yields a simultaneous clustering of the rows and columns of such data, along with a linkage between the row and column clusterings. HICLAS-R analyses of the helping data were run with different numbers of row and column clusters. A model with three situation clusters and three person clusters (or person types) was finally retained on the basis of both goodness-of-fit and interpretational considerations. A graphical representation of the summary behavioral signatures as implied by this model can be found in Fig. 11.

From this figure, it immediately appears that all behavioral signatures are nondecreasing, which means that one situational force dimension can be assumed to underlie the data (Question 1). One could hypothesize that this dimension reflects an excitatory situational force implied by the extent of the need of the victim in each of the emergency situations. To test both this and alternative interpretations, we made use of ratings of the situations from expert judges, in line with the approach advocated by Shoda and LeeTiernan (2002). The correlation between the situation dimension in the model of Fig. 11 and rated amount of need appeared to be very modest only ($r = .29$); yet, sizeable negative correlations were found with ratings of the amount of frustration induction ($r = -.74$) and of the amount of emotional threat for the potential helper ($r = -.73$) (all correlations being based on $N = 16$ situations). The latter two correlations are remarkably high, especially given the fact that the situational force dimension comprised three different levels only. Apparently, overall extent of willingness to help seems to be primarily impaired by an inhibitory situation force associated with feelings of emotional threat; such feelings further especially show up in situations of Situation Class 1 (which, e.g., includes the situation with the beggar woman), and are almost absent in situations of Situation Class 3 (which, e.g., includes the situation with the lost boy in the crowded grocery store).

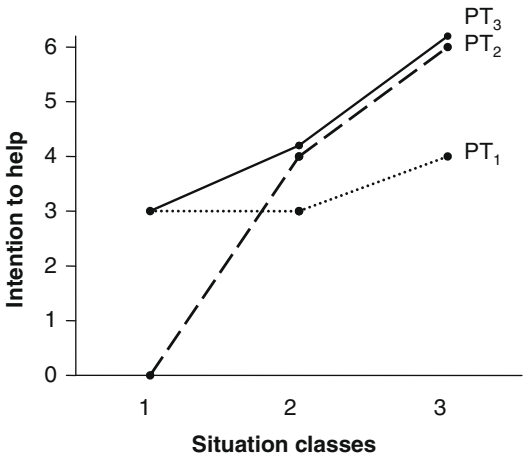

Fig. 11. Behavioral signatures of three person types as obtained from a two-mode clustering of helping data. From "Hierarchical Classes Modeling of Rating Data", by I. Van Mechelen, L. Lombardi, & E. Ceulemans, 2007, Psychometrika, 72, p. 484. Copyright 2007 by the Psychometric Society. Adapted with permission.

The model of Fig. 11 further does not satisfy generalized cross-situational consistency (Question 2). This is because the rank order of Person Types PT_1 and PT_2 is not preserved when moving from Situation Class 1 to Situation Class 2. Finding out whether this reversal constitutes a significant departure from generalized cross-situational consistency, however, would require a confirmatory rather than an exploratory type of analysis (Schepers & Van Mechelen, submitted for publication).

Fig. 11 does not reveal clear differences between situations in situational constraint level (Question 3). Yet, it does reveal individual differences in discriminative facility (Question 4). On the one hand, Person Type PT_2 displays a high level of discriminative facility. This is evidenced by its behavioral signature, which is rather clear-cut and categorical in nature: PT_2 persons do not intend to help in highly unpleasant situations, but they do express a definite intention to help in mildly unpleasant situations. Moreover, there is no doubt in their behavioral signature (which does not take a value of 3, i.e., the scale midpoint score). On the other hand, Person Type PT_1 displays a lot of doubt and avoids extreme responses of any kind; as a result, it has very little discriminative facility. Finally, Person Type PT_3 does not want to give clearly negative answers, whereas it does express a definite intention to help in mildly unpleasant situations.

5. Concluding remarks

5.1. A royal road

A correct choice of variables (traits, beliefs, abilities, measures of cognitive-affective processing units, etc.) constitutes the Achilles heel of many empirical approaches to personality. For example, a

failure to find a high trait-behavior correlation or personality coefficient in a particular study could always be attributed to a wrong choice of the trait (or trait measure). As a second example, an empirical failure to account for contextualized individual differences in some behavioral domain in terms of measured cognitive-affective variables could always be attributed to an inappropriate choice of such variables. The approach to person-in-context behavior as advocated in the present paper, however, works and leads to statements independent of any choice of traits and cognitive-affective variables. Moreover, it would even work if such variables were not or not well measurable (e.g., because they were not available on a conscious level or because they were only accessible via dreams). To illustrate, consider the case in which a competency demand mechanism (Wright & Mischel, 1987) is hypothesized to underlie person-in-context variability in some behavioral domain (e.g., aggression). As discussed above, such a mechanism implies a double monotonic structure of persons and situations as illustrated by Fig. 6. As a consequence, a retrieval of significant departures from double monotonicity would imply the general statement that a competency-demand mechanism is to be ruled out to underlie the data under study, and this for whatever kind of competency and demand dimensions one would ever consider.

The above illustrates the power of our approach and justifies why it can be considered a 'royal road' to understanding the mechanisms underlying person-in-context behavior. Yet, this royal road is not the end of the story. First of all, the results yielded by it are formal and one may wish to supplement them with substantive psychological interpretations (e.g., in terms of active psychological situation features and/or dispositional person characteristics). Second, a correct identification of the structure of person-in-context behavior does not imply but a mould for an account of the mechanisms underlying this behavior. To arrive at the actual underlying processes and mechanisms, a more in-depth further study may be needed. This becomes, for example, clear when one realizes that two persons may display very similar behavioral signatures (and, hence, may be indistinguishable at the level of our guiding questions and their implied data structures), whereas their signatures may result from quite different cognitive-affective processes or mechanisms (which would constitute a case of equifinality).

5.2. Generalization to the case of multiple behaviors

In this paper I have restricted the discussion of behavioral signatures to those cases that involve only a single behavior. Data sets describing multiple behaviors simultaneously will constitute a further challenge. Again, a key step will be to arrive at a better understanding of the structure of (now multivariate) contextualized individual differences to get a hold of the wealth of available information in such data and to pave the way for a deep understanding of the underlying dynamics. An expanded version of the four basic questions as outlined in the present paper may be most useful for this purpose. Such an expansion should, for instance, include questions on the preservation of situation-bound rank orders of individuals across responses, and on the preservation of the rank order of responses across persons and across situations. Patterns of responses to these questions could further be related to existing concepts and theories in the personality domain (e.g., generalized trait models that are amended not only with concepts such as situational trait-relevance, but also with concepts such as trait-relevance or centrality of behaviors). Finally, *triple typology model*-based techniques (Vansteelandt & Van Mechelen, 1998; Vansteelandt & Van Mechelen, 2006) could be most useful to arrive at empirically-based answers to questions on the structure of contextualized individual differences with respect to multiple behaviors. Such models imply a simultaneous reduction of persons, situations, and behaviors to limited numbers of types, with person types being characterized by easy-to-grasp sets of *if situation type then behavior type* rules.

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