Mann, Mitsui, Beswick, and Harmoni (1994) reported a study in which Australian and Japanese children's perceptions of interpersonal rules were compared. In this article, a secondary analysis of Mann et al.'s data was conducted with three-mode principal component analysis to examine both common and culture-specific patterns of interpersonal rules, which were only touched on in the earlier study. A large cultural similarity across samples was found with social status and social distance as the major dimensions that structure children's social world. The sizable cross-cultural differences could be understood as deviations from the common structure. Some of these deviations are explicable in terms of the general variables of individualism and collectivism.

RULES IN CONTEXT
A Three-Mode Principal Component Analysis of Mann et al.'s Data on Cross-Cultural Differences in Respect for Others

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Mann, Mitsui, Beswick, and Harmoni (1994) recently reported a well-conducted study in which Australian and Japanese children’s perceptions of interpersonal rules were compared. They have uncovered a result that counters the well-established stereotype about Japanese children being respectful to people. In fact, relative to their Australian counterparts, the Japanese children in their study showed less respect to various target people ranging from father and mother (in-group) to adults and children in neighborhood (out-group).

Intriguing as the results may be, we contend that Mann et al.'s data can be explored in more detail to reveal both common and culture-specific patterns of interpersonal rules. Specifically, we believe interpersonal rules can be

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examined explicitly as the conjunction of an act (e.g., offer to help if you see someone carrying a heavy box) and a context, which is typically defined by the target person to whom the act is directed. In agreement with Poortinga (1992), we believe we may gain more insight into culture by conducting a more contextualized analysis of human action. This is because it is in the pattern of acts performed in different contexts that gives a signature of a culture. Take bowing as an example. The act of bowing exists in both England and Japan. However, in Japan, this act may be performed in many contexts (e.g., to a guest, a neighbor), whereas in England, this may be appropriate only in the presence of the Crown.

Mann et al. clearly embraced this idea in their design of the study: They factorially combined six specific target persons and seven specific acts. Therefore, in the Act x Target matrix, there were 42 rules in context. Yet, due to a lack of methodological technology, the information contained in this Act x Target matrix was not fully addressed in Mann et al.'s analysis. We report in this article a secondary analysis of Mann et al.'s data that does justice to their original design. The structure contained in the Target x Act matrix will be examined using two-mode and three-mode principal component analysis (PCA) (e.g., Kroonenberg, 1983b).

MANN et al.'S (1994) STUDY

Two types of questionnaires were administered to 184 Japanese children near Tokyo and 173 Australian children in Adelaide (11 to 12 years of age; for full details see Mann et al., 1994, p. 136). One questionnaire (should questionnaire) required all children to say whether they should perform a particular act to a particular target. The response scale varied from always = 2, it depends on how I (you) feel = 1, to never = 0. There were six targets: father, mother, teacher, best friend, adult neighbor, and same-age neighbor. The seven acts were greet respectfully, speak to (target) with respect, offer to help if you see (target) carrying a heavy box, tell (target) the truth even if it gets you into trouble, do what (target) tells you even if you do not really want to, give up your seat on a crowded bus or tram for (target), and stick up for (target) against people who criticize (him/her). Also the other questionnaire (do questionnaire) was administered to all children. This questionnaire (should questionnaire) was administered to all children. This questionnaire differed from the former only in the way the question was asked: Instead of what they thought they should do, they were asked to report what they actually do using the same response scale. Thus, the study had a four-way factorial design: Culture (Australia versus Japan) × Format (should versus do) × Act (7) × Target (6). Culture was a between-subjects factor, and Act, Factor, and
Target were within-subjects factors. The questionnaires were administered in a counterbalanced way.

Mann et al. then summed the subjects' responses across different acts, and computed the composite score of respect shown to each target. Their report primarily focuses on the result of a mixed-design analysis of variance (Culture × Format × Target), treating the composite respect score as the dependent variable. They reported two main classes of findings. First, there was a main effect of Culture: The Japanese children showed less respect to others than the Australian children. In addition, a Culture × Target interaction effect showed that the difference between the amount of respect shown to parents and teachers relative to friends and peers was more pronounced in the Japanese than in the Australian children. Second, although both Australian and Japanese children said they do show less respect than they should, the discrepancy between prescription and self-description was greater for the Australian than for the Japanese children. Although the authors reported the effects of Act, by summing the scores across the targets, they did not systematically examine interaction effects due to Target and Act. It is especially these interactions between Acts and Targets that are the focus of our article.

Mann et al.'s analytical strategy is sensible, given the complexity of the data structure. It may even be a common procedure to collapse across the levels of one factor to render the results interpretable. However, by collapsing across Act or Target, Mann et al. forwent the opportunity to examine Target × Act interaction effects, which lie at the heart of rules in context. Our main aim is to examine the structure embedded in this Act × Target matrix. Three major questions will be addressed.

1. What is the structure of rules in context (i.e., Act × Target matrix) that is common to Australia and Japan?
2. Which aspects of the structure are culturally specific to Australia and Japan?
3. Is the structure of what children say they do similar to the structure of what they say they should? If not, how are they different?

**METHOD**

The structure of rules in context can be uncovered by constructing what are known as biplots (Gabriel, 1971) of the Act × Target matrices for the four conditions (Australian and Japanese children in the should and do conditions) separately and jointly. The major property of a biplot is that the rows (Act) and columns (Target) are displayed in a graph in such a way that the original
element in the matrix can be read from the two-dimensional representation. The data were obtained from Mann et al.'s Tables 1 and 2 (1994, pp. 138-139). Note that these tables contain the mean scores averaged over individuals. In our analyses, the original four-factorial design of Culture × Format × Act × Target will be treated as a Condition (Culture × Format is combined into four levels) × Act × Target design. Thus, our database consists of a three-way data set with a three-factorial design with one observation (i.e., the mean respect score) per cell.

Two types of analysis will be reported. In the separate analysis, to examine the structure of rules in context, we will construct a biplot of the acts and targets via (two-mode) PCA of one Act × Target matrix at a time for each of the four conditions separately. Then we will examine via an external analysis using again two-mode PCA how well the structures of the acts and targets obtained from one condition can explain the data of another condition. This analysis will provide some insights into the similarity in structure of rules in context between conditions, as opposed to the similarity in magnitude as reported by Mann et al.

In the joint analysis, three-mode PCA (see Kroonenberg & De Leeuw, 1980) will be used to examine the structure of Act × Target matrices of the four conditions simultaneously using the TUCKALS3 program (Kroonenberg, 1994, 1996). Three-mode analysis originated in psychology (Tucker, 1966), and Kroonenberg (1983a) is a bibliography on techniques and applications. Some applied articles in social psychology are Imada & London (1979; social perception), Hirschberg (1980; social judgments), and Triandis (1972; subjective culture).

Three-mode PCA derives principal components for each of the three ways so that we can investigate the structures of the Act, Target, and Condition modes both separately and jointly. Joint (bi)plots can be constructed that allow for an examination of the similarities and differences of the three ways (see Kroonenberg, 1983b, pp. 164-165).

To conduct these analyses, we used the double-centered data, that is, column and row means were removed from each entry of each Act × Target matrix. Basically, this removes the main effects of Act and Target from the data of each condition, leaving interaction effects of these two factors. It is essential that by double centering we have not removed all the relevant information from the data set and only look at random variation. To provide insight into the variance partitioning of these data, we have performed a complete ANOVA table for the mean respect scores, including a variance partitioning for the three-mode models to follow (details can be requested from the first author). It was found that the Act × Target interactions in fact
TABLE 1

Fits of Solutions for the Separate Rules × Target Persons Matrices for Unrestricted Analyses and for Analyses Restricted by Configurations of Other Conditions (External Analyses)

<table>
<thead>
<tr>
<th>Culture</th>
<th>Format</th>
<th>Australia</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Should</td>
<td>Do</td>
</tr>
<tr>
<td>Australia</td>
<td>Should</td>
<td>(.91)</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Do</td>
<td>.70</td>
<td>(.94)</td>
</tr>
<tr>
<td>Japan</td>
<td>Should</td>
<td>.47</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Do</td>
<td>—</td>
<td>.32</td>
</tr>
</tbody>
</table>

NOTE: Figures in parentheses indicate unrestricted fit to the data. Other figures indicate the fit of row data to the column configurations. — signifies that no fit was computed due to lack of a relevant hypothesis.

carry the information about the conjunction of Act and Target, which is the rules in context. We believe the proposed procedure enables us to examine the structure of rules in context more clearly.

RESULTS

SEPARATE ANALYSIS

A two-dimensional structure provided a good fit for the Act × Target matrix of each condition (see Table 1 for the percentage of variance accounted for). However, this does not mean the rules are used in the same way in all conditions. Within each culture, we examined how well the structure of the prescriptive (should) rules in context concur with that of the what the children say they do (do) by computing the percentage of the total variance of the do condition data that was explained by the structure of the should matrix. This was done by performing a so-called external analysis (see Van der Kloot & Kroonenberg, 1985, for a detailed discussion of this approach). The component matrices of the Acts and those for the Targets from, say the Australian should analysis, were used to investigate how much variability they together explained of the Australian do data. This caused a moderate deterioration in fit: .21 for the Australian children and .19 for the Japanese children (see Table 1).
This result is in line with Mann et al.'s result that in both Australia and Japan, the children did not adhere to the rules in the same way they said they should. Also consistent is the fact that the discrepancy between prescription and description is somewhat larger for Australia than for Japan.

Cross-cultural differences were then examined by computing the amount of variance of one culture's data that was explained by the other culture's structure for shoulds and dos separately. Differences in structure between cultures were considerably larger than those within a culture. The Australian should configuration has a fit of .47 to the Japanese should data, a drop of .44, and the Japanese should configuration has a fit of .40 to the Australian

![Figure 1: Biplot for Condition x Format Combination: Australian Sample—Should](image)
should data, a drop of .56. The comparable figures for the do data are .32 with a drop of .62, and .20 with a drop of .71. In all, the figures show higher within than across cultural similarity and somewhat greater similarity for the should configurations compared to the do configurations across cultures.

Figures 1 through 4 show the biplots of the structure of the Act × Target matrix of each condition. There is clear similarity on a global scale, but there are also many detailed differences, which are reflected in the fit measures quoted above. In particular, the most important component for the Australian conditions is roughly the second most important for the Japanese conditions and vice versa. We can now examine in more detail how the structures are different between conditions.
JOINT ANALYSES

To obtain a more parsimonious representation, we conducted a joint analyses of all four conditions with three-mode PCA. In this technique, a different number of components can be extracted for each mode. Table 2 reports the fit of three solutions. In the following, $n_1 \times n_2 \times n_3$ means the numbers of components extracted are $n_1$, $n_2$, and $n_3$, for the Act, Target, and Condition mode, respectively. The 9% increase for going from a $2 \times 2 \times 2$ to a $3 \times 3 \times 2$ solution seemed sufficiently large to warrant the third components for the Act and Target mode. Given the differences between the conditions, it is not surprising that a joint analysis requires more components for these modes than the separate analyses.

The additional 1% increase from a $3 \times 3 \times 2$ to a $3 \times 3 \times 3$ solution casts some doubt about the necessity for a third component for Conditions.
Nevertheless, we selected the $3 \times 3 \times 3$ solution for the following two reasons. First, with the chosen solution, the joint solution appears to fit well to all conditions and the differences between their separate solutions and the joint solution is at most 6% (Japanese do and Australian should), which is acceptable. Second, the third component for the Condition mode was exclusively used to model the differences between the should and do configurations in Australia, as we will see later. This was one of the main findings of Mann et al.'s, and our separate analyses also suggested its importance. We will thus report the details of the $3 \times 3 \times 3$ solution, that is, a solution with three components for each of the Act, Target, and Condition modes.

The advantage of using the joint analyses is that we can now investigate one set of Act coordinates superimposed on the Target coordinates, rather than four sets separately. Moreover, we can explicitly describe the cross-cultural similarities and differences in structure of the rules in context.
TABLE 2
Fits of Solutions for the Rules x Target-Persons Matrices for the Separate Two-Mode Analyses and Several Three-Mode Analyses

<table>
<thead>
<tr>
<th>Culture</th>
<th>Format</th>
<th>Two-Mode Analyses</th>
<th>Three-Mode Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2 x 2 x 2</td>
<td>3 x 3 x 2</td>
</tr>
<tr>
<td>Australia</td>
<td>Should</td>
<td>.91</td>
<td>.65</td>
</tr>
<tr>
<td></td>
<td>Do</td>
<td>.94</td>
<td>.84</td>
</tr>
<tr>
<td>Japan</td>
<td>Should</td>
<td>.96</td>
<td>.86</td>
</tr>
<tr>
<td></td>
<td>Do</td>
<td>.91</td>
<td>.73</td>
</tr>
<tr>
<td>Fit three-way model</td>
<td></td>
<td>.79</td>
<td>.89</td>
</tr>
</tbody>
</table>

NOTE: An n₁ x n₂ x n₃ three-mode analysis indicates that the three-mode solution had n₁ components for the first mode (Acts), n₂ components for the second mode (Targets), and n₃ for the third mode (Conditions).

Conditions

The three components for the Condition mode are presented in Table 3. (Note that the components have been scaled to have equal lengths in contrast with the standard practice in two-mode PCA where they are scaled with the eigenvalues.) The first component indicates what the four conditions have in common: All conditions have roughly equal weights on the first component. The second one shows a clear cultural contrast: The Japanese conditions have positive weights, whereas the Australian conditions have negative weights. The third component provides the should-do contrast for the Australian children: The Australian should condition has a large negative weight and the Australian do condition has a sizable positive weight, whereas the Japanese conditions have weights close to zero.

To investigate the nature of the similarities and differences, we have to look at the joint structures of Acts and Targets for each of the components of the Condition mode. The structures are in principle three-dimensional, but (as will become clear) most of the variability may be concentrated in the first component(s). We will first look at the structure that all conditions have in common, next at what the differences are between Australian and Japanese children, and finally at the contrast between the should and do structures for the Australian children.
### TABLE 3
Components for the Culture-Format Combinations (3 x 3 x 3 Solution)

<table>
<thead>
<tr>
<th>Culture</th>
<th>Format</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Australia</td>
<td>Should</td>
<td>.41</td>
</tr>
<tr>
<td></td>
<td>Do</td>
<td>.62</td>
</tr>
<tr>
<td>Japan</td>
<td>Should</td>
<td>.54</td>
</tr>
<tr>
<td></td>
<td>Do</td>
<td>.40</td>
</tr>
<tr>
<td>Explained variability</td>
<td></td>
<td>.66</td>
</tr>
</tbody>
</table>

*NOTE: All components have unit lengths.*

Common structure (first condition component: 66%). Figure 5 shows the first dimensions of the structure of specific acts directed to target persons, which is common to all conditions (the third dimension, 2.5%, is not shown). The major patterns can be examined by the following procedure. First, draw the vector connecting the zero point of the coordinates and the point that represent an act. Second, project the point that represents a target onto the vector for a given act. Projections on the positive side indicate a higher than average endorsement of the act with respect to those targets, and projections on the negative side a lower than average endorsement of the act for those targets. Conversely, one can also draw vectors for targets, and project acts onto them. The plot does not contain the overall level of endorsement, because that is contained in the means that have been removed before the analysis. The figures portray the interaction rather than the main effects. Of course, the conclusions from a plot like this are only as good as the approximation, which is quite good in the present analysis.

The structure that is common between the two cultures is readily interpretable in terms of social status and social distance involving in-group/out-group differentiation. First of all, the acts of telling the truth and speaking respectfully appear to be almost polar opposites: The children speak truthfully more to close targets (father, mother, and best friend) than distant targets (adult neighbor), but speak respectfully to distant others more than to close in-group members. Other major aspects of the structure can be interpreted as a joint effect of social distance and status. The act of obedience (doing what one is told to do) is more prevalent with higher status targets (father and
Constrasts between Japanese and Australian children (second condition component: 22%). Figure 6 can be used to evaluate the differences in what the children say about the contextualized rules between Japan and Australia, regardless of the formats. The two-dimensional structure can be interpreted in a way similar to before; however, the interpretation has to take into account that we are looking at interactions and not main effects. (The third dimension is too small to take into consideration.) This means that all statements are conditional on these main effects. Again, the vector representing an act may
be drawn, connecting the zero point and the point for that act, and then the point representing a given target person may be projected onto those vectors. One point to note is that projections onto the positive side of a vector for an act indicate that the Japanese conditions tended to endorse or perform that act more than the Australians’; conversely, projections onto the negative side suggest a greater endorsement of the act to the targets by the Australian than by the Japanese children. This is because the Japanese conditions have positive weights on the second component, and the Australian conditions negative weights.

Some patterns that emerge from this analysis are generally consistent with the notion of individualism and collectivism (Triandis, 1990, 1995). On one hand, the Japanese children seem to exhibit the tendency of collectivists. The act of greeting the in-group adults (father and mother) more respectfully than other targets is more characteristic of the Japanese than of the Australian children. The act of speaking respectfully to adult neighbors relative to others is more Japanese than Australian. Taking into account differences in overall respect toward the in-group and differences in the overall level of speaking the truth, the act of sharing undesirable secrets with the in-group adults (i.e., telling the truth to father and mother though it gets you into trouble) is also more common among the Japanese children than among the Australian children. On the other hand, the Australian children tell the truth to adult neighbors more often than do the Japanese children, given again the differences in overall levels. This reflects the tendency for individualists to emphasize sincerity (Kashima, Siegal, Tanaka, & Kashima, 1992).

However, some other aspects are not easily explicable in terms of individualism and collectivism. For instance, the Australian children greet respectfully adult and same-age neighbors more often than do their Japanese counterparts. The Australian children speak to their best friend with respect more often than do the Japanese children. This show of respect to neighbors and friends may indeed be a characteristic specific about Australia as Mann et al. suggested.

Turning to Japan, somewhat unexpectedly, the Japanese children said they obey their parents less and do what their nonfamily members (adult and same-age neighbors, and best friend) tell them to do more than do their Australian counterparts. This pattern of a relative lack of obedience to parents and a greater amount of obedience to nonfamily members is, however, consistent with the contemporary observation of Japanese children’s life. According to Tobin (1992), there is a separation between uchi (inside) and soto (outside); the differentiation roughly corresponds to inside and outside family for children. Uchi is the place where children are allowed to amaeru their parents (i.e., to seek their parents’ permissiveness), so that they are given a large
amount of freedom and permission to spontaneously express their feelings. In contrast, the children are expected to behave obediently in soto, because this is the place that requires formality and restraining behavior. This pattern may be quite characteristic about Japanese culture today.

*Contrasts between* should *and* do *for Australian children* (third condition component: 2%). Note that we are looking here at a relatively minor effect and that we are again looking at interactions, which do not contain main effects of Act and Target. A procedure similar to that used for Figure 6 can be applied to the one-dimensional Figure 7. However, due to the one-dimensionality of the plot, the points for target persons already lie on the vector that connects the zero point and the point for an act. The targets on the positive side of a vector indicate that the Australian children tend to say they do a particular act more than they say they should. The discrepancy between do and should is primarily concentrated in the obedience to and sticking up for father and
teacher. Not taking into account the overall (average) differences in should and do, the Australian children say that compared to their average level of obedience, they obey their father more than they should, and that they should stick up more for their father than they do. In contrast, they say they should obey their teacher more than they do, and that they stick up more for their teacher than they should.

**DISCUSSION**

The advantage of examining rules in context is its capacity to reveal a cultural signature, a cultural pattern of contextualized social action. Cultural signatures reflect patterns of social action within a given cultural context. Mann et al. found that the Australian children appear to endorse respectful rules more than the Japanese children do. This cultural difference may be a striking finding. However, our concern for rules in context require us to ask the following questions. Within the context of the high level of respect shown by the Australian children, who commands what kinds of respectful behaviors? Even if the Japanese children do not exhibit respectfulness, do they endorse respectful rules in some contexts more than others? The present reanalysis is an attempt to provide some answers to these questions. Mann et al.'s original report revealed some global trends: Japanese children's tendency to show greater respect to parents and teachers than to their friends and peers was more pronounced than that of Australian children, the trend Mann et al. interpreted as reflecting the collectivism of the Japanese culture. However, their analysis failed to reveal more detailed cultural differences. For instance, it is such social acts as greeting more respectfully to parents than to others and speaking more respectfully to adult neighbors than to others that mark Japanese children, rather than global respectfulness to higher status in-group adults such as parents and teachers. Moreover, the Japanese cultural signature was apparent in the Japanese children's tendency to obey nonfamily adults more than their parents (i.e., doing what they are told). Mann et al. did not discuss this finding. Australian children, on the other hand, tell the truth to their adult neighbors more than to others, but their Japanese counterparts tell the truth more to parents than to others. This tendency may be explicable in terms of individualism and collectivism, but it was not easily discernible from the traditional analysis Mann et al. carried out. The Australian children's show of respect to their friends and neighbors relative to others is surely one cultural signature that Mann et al. did not pick up.

The detailed and explicit analysis of cultural difference in rules in context was made possible by the three-mode PCA. The advantage in analyzing the
Act x Target matrix in this manner should be clear from the preceding discussion and apparent in comparing the results obtained in the separate analyses with those reported in the joint analyses. When examining separate analyses individually, it is difficult to identify explicitly the structure of the data. However, once we know where to look for the patterns described in the joint analyses, those patterns can be easily traced in the separate plots per sample. To the extent that a culture may have a particular signature in the pattern of acts performed in certain context (that is, the structure about what types of acts are typically performed in certain contexts), the three-mode analysis provides a useful approach to describing and exploring the data about human behaviors in context across cultures. One of the major advantages of three-mode analyses in cross-cultural research is that this method can extract structures that are common across cultures as well as structures that are specific to some culture. As many researchers have noted, cultural differences are only meaningfully interpretable within similarities across cultures. Within the four Act x Target matrices, we found that 60% of the variances were common across the four samples taken from Australia and Japan, showing a large cultural similarity. In particular, the finding that social status and social distance (in-group versus out-group) are two of the major dimensions that structure children’s social world is revealing, and it would have been difficult without the use of the three-mode PCA. The sizable cross-cultural differences were embedded in the common structure of rules in context. That is, cultural differences are understood as deviations from the common structure. As discussed before, some of these deviations are explicable in terms of the general variables of individualism and collectivism. Yet, some other aspects
cannot be easily accommodated into these theoretical constructs. The cases in point are Australian respectfulness and Japanese obedience outside family. Further, against these cultural patterns, the discrepancy between prescription and self-description in Australia may be peculiarly Australian, something that social psychologists can probe into more deeply.

REFERENCES


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