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HOW TO ORIENT YOURSELF IN BALINESE SPACE: COMBINING ETHNOGRAPHIC AND PSYCHOLOGICAL METHODS FOR THE STUDY OF COGNITIVE PROCESSES

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Introduction

We have worked for a few years, even if sporadically, towards establishing a true collaboration that combines our two disciplines, social anthropology (in particular, cognitive anthropology) and cross-cultural psychology (in the area of cognitive development). We have had the opportunity of working together in the field in Papua New Guinea (Wassmann and Dasen 1994a; 1994b) and Bali (Wassmann and Dasen 1998) as well as to discuss our ideas with colleagues during a workshop that we organised jointly (Wassmann and Dasen 1993). Hence, we have worked towards defining a shared methodology, as described below, and intend to apply it in the context of field research in Bali and elsewhere (Mishra, Dasen and Niraula 2003).

Anthropology and Psychology: Combining Methods

We have already put forth, in German (Wassmann 1993a) as well as in English (Wassmann and Dasen 1994a), the choice of methods that seems most adequate to us. Consequently, in the present context we will focus only on discussing our research strategy (composed of three main stages) without further reference to the analyses and critiques that justify our choices.

We propose a strategy of three stages that requires the integration of (1) a description of the cultural and linguistic system, obtained mainly through interviews, (2) a study of behaviour in daily situations, derived

from observation, and (3) induced situations. It goes without saying that these three stages will not remain the same throughout the process of study. Nor will they be equally important for each research. That is, the sequence of stages is not rigid, but rather will provide a wider range of options. There is only one restriction: the third stage must begin after the first two.

Description of the Cultural and Linguistic System

Upon arrival in the field, the ethnographer (anthropologist) normally starts questioning some key informants who, due to their position or status possess overall knowledge, and should be capable of presenting a coherent image of the normative cultural system. With these key informants, who come to work closely with the anthropologist, one obtains the qualitative base of the entire ethnography. In some cases (such as in the case described below), this information is already widely available in the form of previously published materials.

With key informants it is also possible to acquire an array of linguistic material, such as for example, the breakdown of concepts in semantic structures. Knowledge of one informant is then verified by cross checking with other informants. This is done in various ways, as for example, through participant observation.

There was a time when the ethnographic research would go no further. Within the field of anthropology, for instance, there was a tendency for the anthropologist to be satisfied in obtaining a taxonomy that was considered to reflect the knowledge of a given culture. Presently, this no longer suffices. In fact, knowledge, including linguistic knowledge, is not necessarily shared by a collectivity of people. It is necessary to scrutinise the distribution of knowledge by age, gender, social status, education, experience and so on (Wallace 1961; Boster 1985; Romney, Waller and Batchelder 1986; Borofsky 1994). Therefore, following the tenants of sociology or psychology, the anthropologist will conduct interviews with as many people as possible. For the most part, he or she will engage in semi-structured interchanges, to be followed later by a qualitative analysis. The administration of questionnaires is not feasible in most contexts where anthropologists work.

Often taxonomies do not correspond to the ways that people talk in daily life, that is, what people state as rules does not necessarily correspond to what they actually do. Knowledge is not the same as knowing (how to do). One might ask then, how do people apply normative systems to specific situations? How do the 'jpfs' (just plain folks, cf. Wass-

mann 1994b; see also Dasen and Bossel-Lagos 1989; Fournier, Schurmans and Dasen. 1999) adjust to the realm of daily life carrying with them knowledge that is partial or even deviant? To address questions such as these, observation is crucial.

Daily Life

The study of ordinary situations, happening every day, allows for the verification of whether verbal descriptions of a cultural system are merely a theoretical construction or whether they are embedded in action. On the one hand, one is to determine whether the cultural system is identified across various segments of the population or whether there is segmentation across a socially differentiated population.

Participant observation has been, since the inception of anthropology, an integral component of fieldwork. Moreover, as circumstances have changed, the anthropologist is required to observe in a more systematic manner a bigger range of the population studied.

However, observation is not always possible. If one wishes to study, for example, problem solving, there is no certainty that a situation amenable to inquiry will emerge spontaneously. In the event that a problem does actually take place, there is the risk that it may be solved in a hidden manner, sometimes even without the agent being aware of it. This poses great difficulties to the understanding of the processes.

Induced Situations

To study phenomena that do not occur spontaneously with sufficient frequency, or in which the processes are difficult to observe, the fieldworker resorts to placing the informants in situations that will prompt the phenomena he or she intends to study. Although these are not experimental situations in the strict sense of laboratory psychology, these situations are, nonetheless, always new, unusual, and artificial. For instance, they can take the form of a psychological test.

It is a necessary condition that these induced situations always be situated in the ethnographic context established through the first two phases of the investigation. The issue for study is chosen precisely on the basis of this knowledge of culture and so are the criteria for organising the experiment. Sometimes this may consist of organising a 'game' whereby the subjects interact almost without intervention from the researchers, or, of situations that are minimally intrusive such as asking for drawings (Toren 1990; Wassmann 1993a). On other occasions tasks can be invented as a replacement (e.g. the classification of objects picked out

from the local culture, cf. Wassmann and Dasen 1994a). In certain cases, as we will illustrate below, the use of more standardised tasks can also be justified provided that they are adapted to the situation.

Although the methodologies of experimentation and observation have become common in the social sciences, anthropology generally does not accept such an intrusion as easily. If the situation must be new in order to fit the goals of research, does this not risk being so artificial, so unusual and bizarre that it cannot lead to reliable and valid observations?

These problems, quite real in nature, have been discussed various times (e.g. Ciborowski 1980; Berry and Lonner 1986; Poon, Rubin and Wilson 1992); we have also revealed previously (Wassmann 1993a) the extent to which the interventions can be intrusive and destabilise relationships of trust established during the first two stages of research. One must then proceed with great caution, not only to secure the validity of results, but also to guarantee good relations with informants as well as amongst researchers. To be sure, these problems can be solved, as the work of M. Cole & collaborators has demonstrated in the setting of 'experimental anthropology', or more recently in the context of work exploring practical knowledge (for a review, see Berry, Poortinga, Segall and Dasen 2002).

We will now illustrate the methodology we propose, through a study conducted in Bali that focused on systems of spatial orientation that are particularly important in Balinese language and culture. We will present this system at the cultural and linguistic level, describe how it is applied differently depending on context as well as how it is used in daily life and, discuss the use of induced situations that allows for examining the influence that this system has upon processes of memorisation and spatial representation. In short, this study analyses the relationship between language and cognition and, therefore, contributes to re-launch the debate about linguistic relativity.

The Cultural and Linguistic System

Kaja-Kelod

Numerous authors have described the Balinese orientation system and its centrality in Balinese culture (Belo 1935; Covarrubias 1937; James 1973; Hooykaas 1974; Hobart 1978; Howe 1980; Eiseman 1990, Reuter 1996, Hauser-Schäublin 1997, Ramseyer 2002). Hence, we will refer to existing literature on this topic as a replacement for interviews with key informants.

All these authors agree that orientation is extremely important for the Balinese. A direction describes not only a vector in physical space, but also cultural, religious, and social points of reference. Orientation begins with the volcano in the centre of the island, Gunung Agung (3142m) where the Balinese Hindu Gods live; 'towards the mountain' or 'upwards', the sacred, pure direction is called *kaja* and, the opposite, 'towards the ocean', 'downwards', *kelod*. It should be noted that the ocean, however, is not evil or impure. On the contrary, it can purify and supply sacred water. *Kaja* can be translated into English or Indonesian as 'north'. However, this translation is only correct in the south of Bali; the *kaja-kelod* axis, as will be described below, rotates as one moves around the island. On the northern side of the island *kaja* is actually to the south. This system of orientation can also be found in other South-East Asian and Oceanian languages (Barnes 1993).

Another direction considered to be sacred is *kangin*, the direction of the sunrise, that is seen as another important manifestation of God; opposite to it is *kauh*. In principle the axis *kangin-kauh* is orthogonal to the axis *kaja-kelod*, with kangin to the east. East and west, *kangin-kauh*, are identified by all in the island, states Eiseman (1990: 230), wrongly as we shall see below.

According to the literature, intermediary dimensions of *kaja-kangin*, *kelod-kauh*, are also frequently used. To each of the eight possible directions, as well as for the centre, corresponds a God and a colour. All of the Balinese cosmology is structured along three points—high, middle, and low—oriented along the axis *kaja-kelod*, from the human body to the organisation of the universe, including the structures of temples and villages, the social structure, and even stages of life. The goal is to preserve at all times the equilibrium of this structure.

Numerous aspects of Balinese life are thus organised according to this schemata. The villages are aligned *kaja-kelod*, with its main temple, dedicated to Wisnu, on the side of the mountain, and the cemetery on the side of the ocean. Each temple is aligned in the same way and, in their interior, so are the several altars. The houses of a lineage of families are oriented in a similar fashion, with the family's temple at the most sacred juncture, *kaja-kangin*. The family's chief lives on the *kaja* side and everyone must sleep in the direction of *kaja* or *kangin*; so too the disposition of other house-elements must follow similar rules. The kitchen is on the *kelod* side, and the animals are placed at the least sacred extreme, *kelod-kauh*. The symbolism of the eight directions (and the centre), and its related colours, is important in the preparation and disposition of gifts.

The level of disorientation that the Balinese feel when they 'loose their north' has been frequently mentioned. Geertz (1983 [1972]: 207), for example, wrote that for the Balinese, life is not organised if they cannot keep precise orientation in space ('not to know where north is to be crazy'). Eiseman (1990: 3) wrote: "Each Balinese seems to have a keen sense of orientation and if, for any reason this sense is gone, the individual feels visibly uncomfortable and disoriented". Similarly, McPhee (1944) described the total inhibition (verging on depression) of a young boy he had recruited in another village for a dance lesson. It was not until he was shown Gunung Agung beyond the nearest landscape, that he was able to start to dance[1]. Talking of fear and anxiety related to disorientation, Bateson and Mead (1942) mention that these could lead people to become sick. Jensen and Suryani (1992), two psychiatrists—one of whom is Balinese—find these terms exaggerated, and think that the example reported by McPhee is atypical. According to these two psychiatrists, when a Balinese arrives to an unknown place where he cannot orient himself, he conforms rather than becoming sick. However, these authors do agree that disorientation induces tensions and a "state of confusion (*bingung*) in which it is difficult to pursue one's thoughts and speech clearly" (Jensen and Suryani 1992: 76).

The use of this system of orientation seems to be learned quite early by children. According to Bateson and Mead (1942: 6), "the words for the cardinal points are among the first that a child learns and are used even for the geography of the body". A Balinese will tell you that 'there is a fly on the 'West' side of your face'. Moreover, Balinese babies learn very early that they should not confuse their left hand with their right hand. The latter is used for touching food, while the left hand is used for bathing. The left hand should never be used to touch food, point at something, or receive a gift.

The Spoken Language: Space Games[2]

In order to complete these descriptions, one of us (Wassmann) administered a linguistic survey by using a standard procedure called 'space games', developed by the research group of cognitive anthropology at the Max-Planck Institute of Psycholinguistics in Nijmegen (de Leon 1991; Levinson 1992b). In order to ascertain how language is used in the description of spatial points of reference, an imaginary situation that stimulates two people to talk is organised, such that they do so almost without the participation of the researcher. It is therefore, an induced situation that allows a further step forward compared to a simple ethnographic description consisting of the variations in use of language from one individual to another.

1 This anecdote is interesting because it shows how directions are utilised during the process of learning how to dance: the teacher gives instructions of the type 'three steps to the east, then turn yourself south-west' (McPhee 1994: 124)

2 We thank Nengah Danta, who worked as interpreter, translator, and assistant and Prof. Gede I Pitana for fruitful discussions.

Each 'player' is given a series of similar pictures that represent two persons in different positions and orientations, sometimes with a common element of reference such as a tree or an animal. The two players are separated by a screen. The conversations take place in Balinese language, are taped, and later transcribed and translated. This part of the study took place in two villages in the south of Bali, as well as in several villages in the north and west of the island. A total of 174 description were obtained from 29 pairs of players, both children and adults. The analysis reported here counted with the presence, for each picture, of at least one—absolute, egocentric, or intrinsic, —descriptor (a, e, i).

In order to explain these terms, let us consider as an illustration one of the pictures that were used. In our own habitual language, we describe it in the following way:

"Two men are side by side, at a certain distance. They have a stick in their right hand. The man on the right looks at me, the one on the left looks to the other side."

The descriptors such as 'on the right' and 'on the left', 'towards me' are said to be egocentric (or egomorphic, projective or deictic) because they are relative to the observer. 'Two men side by side' at 'a certain distance' are intrinsic descriptors, because they refer to the relative position of an object in relation to another, independent of the person who does the description.

These two types of descriptions are familiar to us because these are the same that are used in Indo-European languages. However, there exists a large number of languages that use (in addition to intrinsic descriptions that seem to occur in all languages), preferably, and at times exclusively, absolute descriptions, as for example, Guugu Yimithirr aboriginal language in Queensland (Haviland 1993), and Tzeltal, a language of the Maya from the Chiapas region in Mexico (Brown and Levinson 1993b). This entails descriptors that are independent from the observer, as well as of other objects, fixed on the exterior, such as the landscape: upwards/downwards, towards the mountain/the ocean, facing sunrise/sunset, etc.

On occasion, some languages use both absolute and relative descriptors, but with a preference for the first. This applies to the Yupno from

Papua New Guinea (Wassmann 1994b) who use the concepts of right and left only to refer to the localisation of objects that are in direct contact with the body, and absolute referents otherwise.

The Balinese language allows for the use of the three types of descriptors—absolute, egocentric, and intrinsic, but with a preference to absolute referents (*kaja*, *kelod*, *kangin* and *kauh*). Therefore, a typical description of the same photo mentioned above is the following (the observer is oriented towards kaja):

"A man is at *kauh* and the other at *kangin*. The one at *kauh* faces *kaja*, and the one at *kangin* faces *kelod*. They are a bit separated. The one at *kangin* has a stick in his *kauh* hand; the right hand of the one at *kauh* also has a stick."

Such a description entails at least an example of each type of descriptor—absolute, intrinsic, and egocentric. The great majority (98%) out of a group of 29 pairs of observers used at least one absolute descriptor for each picture. Egocentric descriptors are very rare, with the exception of the adults of the South side of the island, where they are used for 36% of the pictures though almost always in combination with absolute describers. This difference between the north-east and the south is due to a greater familiarity in the south with the Indonesian, as well as the factors of acculturation emerging from travelling by motor bike or car. Young children (7-9 years old) use only absolute describers, while the older children (11-15) and adults also use intrinsic descriptors for half of the pictures.

The almost exclusive use of the absolute system of reference in the Balinese language corresponds greatly to its symbolic importance in this culture. In other words, there is coherence between the cultural system and the language system.

The System of Orientation in Everyday Life

It is easy to observe the importance of the system of orientation in ordinary Balinese life. At all times, the terms in question appeared in conversations. People use the absolute terms to indicate a path or where they are going ('I am going kauh in the afternoon.'), or to explain a route 'turn left, then go kangin', or during a meal, one can say 'pass me the dish that is at kaja'. On reporting about a meeting, one refers to a person as 'the

one sitting kelod'; one memorises, it seems, the positions in absolute terms.

Children must learn to follow instructions by using this system of orientation, at home or outside. It seems that some elementary schools use this knowledge as a criteria of aptitude for beginning school. During the process of teaching in Indonesian they insist on relative descriptors. For example, in order to draw the attention of students to the difference between a 'b' and a 'd', instead of using front/back or right/left, they rely on *kaja/kelod* in order to make students understand the difference.

The system of orientation appears in a great number of social situations. During cock fights, for example, at the moment of deciding which is the favourite for placing bets, supporters shout as loudly as possible a word that refers to the chosen cock; this can be the colour of its feathers, but also its location.

Another example of a situation where directions are an intervening factor, is the game of chance called kelos or kece. The players are divided into four groups and sit down according to the four directions. They decide for one direction in the following way: the director takes by chance one hand-full of coins and throws them into the groups until he has only four or less left. This number indicates the winner direction which corresponds to a sitting direction of one particular group (1=*kaja*, 2=*kauh*, 3=*kelod*, 4=*kangin*).

On one occasion we observed in detail in the village of Lean, North-East Bali, where players of a neighbouring village were visiting, the beginning of a game that gave place to the following exchange:

"Which system will we use, Bunutan or Lean?
The Lean system.
In Bunutan and here, *kaja* and *kelod* are in the same direction
kangin and *kauh* are different.
Here, *kauh* is on this side (towards Seraya).
For *kangin*, is four coins; *kangin* is there, on the side of Bunutan."

In this case, the players had to be able to arrive at an agreement about the chosen system of orientation, since, as we will see below, it is not identical in the two villages.

In effect, contrary to the descriptions that exist in the literature, we realised that the system is not uniform, but rather that it adapts to the topographic conditions of localities, that it may depend on specific historical circumstances, or that the systems may even be used differently by individuals within a place. Therefore, if *kaja* does indeed refer to the direction of the mountain, it does not necessarily refer to Mount Agung,

especially when it is not visible, but to another closer elevation. In certain cases, as we will demonstrate below, *kaja* refers to a direction even where there is no mountain, such as the ocean.

We have examined in detail how the inhabitants of different localities in the north-east peninsula of Bali use the system. Going around the peninsula opposite to clock direction, kaja remains oriented towards the closest elevation, usually the mountains in the centre of the peninsula, while the *kangin-kauh* axis changes following the curvature of the coast. For the inhabitants of the east end of the island then, the sun rises at *kelod*, and *kangin* refers to the north.

One might think that *kangin* and *kauh* are always situated, respectively, to the right and to the left of the *kaja-kelod* axis, somewhat like the directions east and west which stay the same as one travels around the world along the equator. However, this is not the case: at a given moment, the system is inverted. The inhabitants of the two villages where this reversal occurs are well aware of this situation, and, as the example above indicates, they adjust their way of talking accordingly when they visit their neighbours. There is even a place between the two, where the two systems coexist. Apparently, this situation emerges form the history of populating the region. Further away, beyond the coastal area, the system changes even more. Within the peninsula, one finds three additional systems, with, at each border, an intermediary system that is relevant for only a small distance.

In this way one sees that there isn't a single translation of kaja that can be applied to all possible situations; not only is 'north' (or *utara* in Indonesian) inadequate and 'uphill' is more correct than 'towards the mountain'. *Kangin* is usually located to the right of the axis, but is sometimes left, referring more or less to the direction of sunrise in most cases, though not always.

In certain cases, the adaptation to local topography, combined with historical elements, results in the complete change of the system in comparison to the normative description. Therefore, the Balinese use this system in a localised manner. One could even say that their absolute system is relative! Or, using the terminology of Frake (1990), 'contingent'. The system is absolute (geocentric) in the sense that it refers to distant referents, not linked to the body nor to the immediate environment, but contingent, because it is linked to topography.

If the system of orientation established from the cultural knowledge of south Bali constitutes a complex system that entails spiritual dimensions, this aspect remains the affair of experts, detached from the lives of most other people, at least in the East of the island. We conducted 25 interviews about this topic, many of them with small groups of people.

No one knew the colours or the Gods in terms of the eight directions. They knew these existed for the four main directions but did not know details, responded by chance or made errors, referring to the need to rely on a specialist for this matter.

And how are the terms right and left used in ordinary life? These are mostly used to refer to the body or people and objects close to the observer (at a maximum distance of about one meter). However, absolute descriptors are also often used for these situations. Children, trying to distinguish their right hand from their left hand, always used absolute directions, even for objects that they are holding. Describing which way to follow, adults often use 'turn right or left' but systematically add 'towards' and one of the absolute directions (for example, 'I turn right towards kaja'). There is hence, in Balinese language, the possibility to combine the two systems of spatial reference, with considerable tendency to use the absolute system.

We can now ask how this influences representations of space. When the issue is, for example, to memorise a certain disposition of objects in space, there are two ways of encoding information: using only relative referents, or only absolute referents, or a combination of both.

It is virtually impossible to determine which spatial representation the Balinese use by means of interviews or even observation. To be sure, this encoding is automatic and unconscious, which inhibits us from provoking introspection in daily contexts. Consequently, we found ourselves forced to use induced situations.

Induced Situations: Encoding for Spatial Representation

For this component of our research we have used two tests invented by the Cognitive Anthropology Group (Levinson 1992a; Brown and Levinson 1993a; Danziger 1993; Wilkins 1995; Levinson and Nagy 1998; for a recent complete review, see Levinson 2003). These tests are called 'Animals in a Row' and 'Steve's Mazes'. The standardised nature of these tests allows different groups of researchers of this team to obtain observations that can be compared across linguistic groups[3]. Hence in the

3 Details about the procedure can be found in the manual (Danziger 1993 and Levinson 2003). For the first part of the experiment we followed closely the established procedures except that we maintained a constant order during the presentation of the trials (instead of randomly changing the order). In addition, after the fifth trial we asked our subjects how they had memorised the display. Finally, if on the maze test they had chosen a wrong solution, we demonstrated why this was not a correct an-

present case, the induced situations were not developed directly from our ethnographic observations, but we used them only because we felt they were easily adaptable.

All the tests are based on a single, simple, paradigm: one presents the subject with a stimulus entailing spatial information; he/she is then asked to turn 180 degrees, and is then asked to perform an action related to a similar stimulus.

For example, let us suppose that we place on the table in front of you an arrow pointing left; you turn around 180 degrees, and we present two arrows, one pointing to the left and one pointing to the right, and you are then asked which of the two arrows is identical to the one on the first table. If you choose the one pointing to the left, you have relied on egocentric encoding, relative to your own body. However, if you encode space in absolute terms, you choose the arrow pointing to the right, since it displays the same absolute direction (i.e. to the west if you were oriented to the north at the beginning of the experiment).

Note that the relative coding leads to choose a stimulus that is identical to the visual image of the arrow on the first table, while absolute coding leads you to choose a stimulus that is the mirror image of the former, and thus entails a transformation of sensory information. Therefore, it is possible to conclude from a non verbal behaviour what type of coding is being used.

All of those who speak mainly an European language have the habit of choosing the relative system. An absolute coding will appear to them to be bizarre if not incomprehensible, to the point where developmental psychology, the cognitive sciences, and even our philosophical traditions, have considered that the conception of space belongs necessarily to the body proper, establishing this view as a 'canonical position' (Clark 1973: 34), adding that the relative conceptualisation of space was universal, since it was 'more natural and primordial' (Miller and Johnson-Laird 1976: 34). (For a more detailed discussion of the ethnocentric character of this assertion see Wassmann 1994b.)

Method

During the initial phase of our research we have relied on two tests in their standardised form. The experiment took place on the veranda of the house of one of the researchers, in the village of Bunutan on the north-east coast of Bali. Moving from one table to the other, the subject had to perform a 180 degree rotation, after a pause of 30 seconds (without any

swer (by returning to the first table), and allowed them to make another attempt.

other distraction but to look at a clock)[4]. During this first part of the experiment, no verbal clues were given in the instructions that might incite the subject to use a particular spatial system of orientation (in other words, we would not mention neither right or left, nor kaja, and so on).
For the animals test, a series of three animals (chosen from four available figures, a duck, a goat, a frog and a turtle) was presented on the table, for five successive trial after an initial training session. The subject was asked to remember the display in order to reproduce it on the second table. We took notes of the order of the animals as well as of the direction of the alignment.

For the second test (maze), the drawing of a landscape, with a house, a river, and trees was presented on the first table. A path was indicated in the form of an irregular line stopping at some distance from the house. The test included five of these drawings plus a demonstration (see figure 1). The researcher explained to the subject that the goal was to find the way back to the house, without crossing the river or the forest tracing this pathway with a finger, and informed the subject that he or she should memorise the pathway. On the second table there were three cards to choose from, with drawings of alternative pathways, one representing a relative solution, another an absolute solution, and a third one with a false solution (D for distractor).

4 This break is meant to avoid iconic-visual memorisation which could lead the subjects to opt for relative solutions (Danziger, 1993: 7). We followed this precaution systematically for all experiments even through trials indicated that similar results could be obtained with a 5 second break.

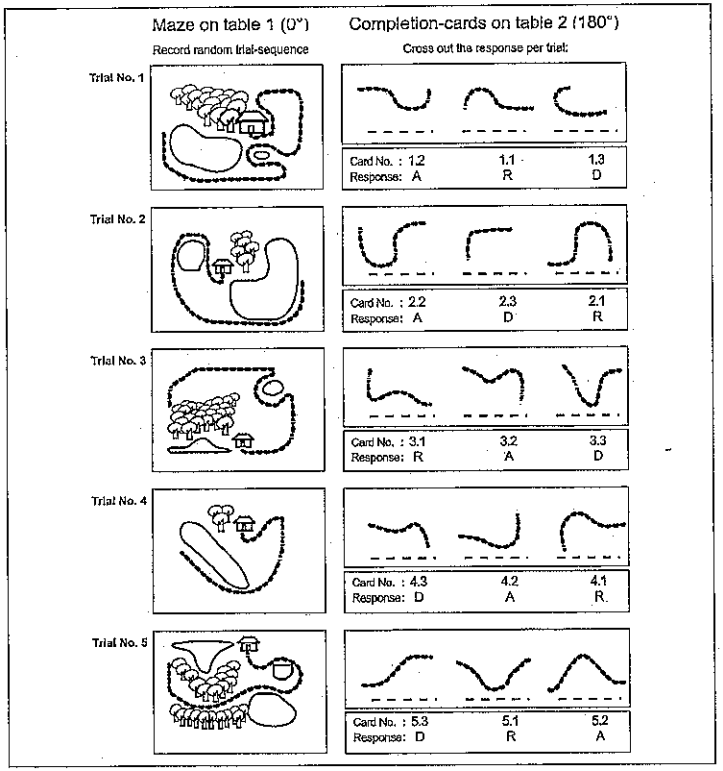

Figure 1: Transcription sheet for Steve's Maze

This experiment was conducted with 28 subjects, of which 8 were children aged 7 to 9 years old (0 to 2 years of schooling), 8 children aged form 10 to 15 years old (2 to 5 years of schooling), and 12 adults (between 20 and 60 years old, 0 to 6 years of schooling), with equal representation of gender. In addition, a simplified version of the animal test (two figures instead of three, intervals from 5 to 10 seconds) was administered to 10 children aged between 4 and 5 years old[5].

After 6 or 7 weeks, we repeated the experiment with the same subjects[6], but with some modifications meant to induce the opposite type of encoding from the one they used spontaneously. For example to influence relative encoding we used relative referents ('all animals look to the right'; 'the pathway moves away from you, and then turns right'). Also, the two tables were moved by 30 degrees in relation to the *kaja/kelod* axis, and the animals on the table was put on an angle of 30 degrees in relation to the borders of the table. For the maze test, the drawings were presented on a base with a 45 degree inclination, instead of disposed flatly on the table.

5 We tried the test with 17 children of this age. However, 7 of these did not manage to understand the instructions. It proved to be impossible to use Steve's maze with children of his age-group.

6 Only one subject could not participate in the second part of the experiment.

Results

Note that memorisation is not what interests us in the performance on these tasks, but rather we aim to obtain information on which type of spatial orientation is used. Memorisation is indicative of the difficulty of the task, that should be sufficiently easy for children to execute, and still remain interesting for the adults. We believe that this was achieved. In the first test, 17 errors (inversion of the order of the animals) were made during the first session (out of a total of 140 tests administered to 28 subjects), and 9 (out of 135) during the second session[7]. Perfectly adequate for the children, the situation was somewhat ludicrous for the adults, which might be the main reason why the later made as many mistakes as the children. The maze test is somewhat more difficult, with 25 errors (choice of the distractor, which was always corrected on the second attempt) out of 149 items during the first session (9/135 during the second), especially by younger children (13 errors, in comparison to 5 and 7 for the other groups). The behaviour and comments of adults indicates that this was a bit of a challenge for them, a real problem to solve.

First Session

The results from the first part of the experiment are presented in table 1.

	Animals	*Steve's Maze*	*N*
4-5	.96	-	9
6-8	.80	.58	8
9-11	.73	.58	7
12-14 + Adults	.86	.49	14

Table 1: R-A gradients on spatial encoding tasks by age-group

7 The first animal in the sequence was always correct and even when there was an inversion of the two other animals we could still classify the answer.

On the animals' test, the majority of subjects displayed systematically absolute reactions, and none showed systematically relative reactions. Comparing these results with those of Brown and Levinson (1993a), we observe that they are similar to the ones obtained amongst the speakers of Tzeltal of Tenejapa in Mexico, and opposed to results obtained amongst the Dutch who reacted mainly in a relative manner.

In the case of the maze test, only one quarter of the subjects reacted systematically towards the absolute, while the majority mixed absolute and relative choices. Another quarter of the subjects made systematically relative choices. This result resembles that of Brown and Levinson in Tenejapa, not for the same test which they apparently did not use, but for other tests of the same kind.

One may add to these results, for the first test, the reactions of 10 children aged between 4 and 5 years old. These only give systematically absolute answers. This corresponds closely to the language they use, which is completely absolute: even for an object held in the hand they never use left and right, but always absolute directions. Children aged 7 to 9 years old, use an absolute coding for the first test, though for the second test half of their answers are relative. The increase of relative answers is also noticeable in the 11 to 15 years old group for the first test, and for the adults in the second. It would appear therefore, that there is slight tendency for a developmental change with age (or with the number of years of schooling) whereby the amount of relative answers increases with time. Nonetheless, this trend is not statistically significant (Fisher-Yates).

The fact that a test is non-verbal does not necessarily mean that it does not lead to linguistic coding. Our first task certainly has a higher tendency to promote this form of coding, in the form of sentences of the type 'the duck is in front, and the turtle in the middle, and all look towards *kaja*'. Obviously, linguistic coding would be equally easy in the relative form ('they all look right') but we have noticed that in the use of language the absolute system clearly predominates. This linguistic strategy is much less applicable to the maze test, where the configurations seem more likely to be encoded iconically.

This difference in strategy is reflected in the introspection obtained on the fifth trial: first, the subjects express themselves more easily in reference to strategies used in the first test than in reference to the second. For the first test, the majority of subjects stated 'down there (on the first table) the animals faced *kaja*, so here they face *kaja*'. On the second test, the subjects who gave mainly absolute answers claimed to have memorised the image of a route, sometimes describing its shape ('like the letter U', like a belly whose curve faces *kauh*'). Those who gave relative answers talked of following the route, e.g. from right to left. An adult who made five relative choices stated 'I remember the shape the route goes from left to right; one cannot describe it with *kaja-kelod*'. On the first test, however, he had provided five absolute answers.

In conclusion, our subjects have the possibility of using two systems of coding, just as the Balinese language allows for a choice between relative and absolute descriptors. However, the preference for the absolute system was evident, especially in the first test, for which a single word in the absolute system is sufficient for coding the orientation of the display. A relative system of coding is chosen more often for the second test, that is more difficult to code verbally.

If one takes into account the two tests at the same time, only five subjects provided systematically absolute answers. Consequently, it appears that the choice between absolute and relative systems of coding is not inherently a personal characteristics, related to some internal cognitive orientation, but that all subjects, except possibly the younger ones, can indeed 'choose', or be lead by the task's demands or the experimentator's instructions, to use one or the other.

The layout of the tables might have favoured absolute answers, since everything (the subject and the objects) was ordered according to the main directions of the absolute system. On the other hand, for the second test, some features, for example the projective nature of the drawings of the trees and house, could favour more relative choices.

These observations have lead us to repeat the same experiments while introducing some changes to the display and the instructions, somewhat like Brown and Levinson (1993a) did in order to clarify the mixture of absolute and relative answers that they found among the Tenejapan. These authors presented the hypothesis of the coexistence of the two systems: 'Tenejapans would thus have two competing conceptual coding systems that can both be utilised in tasks of the sort presented' (p.48). We extend these authors' hypothesis for the Balinese case, particularly since the two systems are available in the Balinese language.

Second Session

Recall that in the second session the instructions and object were prepared in such a way as to lead the subjects to change their type of predominant answer (from absolute A to relative R, or vice versa). Table 2 presents the number of subjects who changed, as well as those who did not change; for the first category a change in encoding had to occur on at least two items (e.g. from 4 or 5 A to 1 or 2 A, or 3A to 0 or 1 A, but not 3A to 2A).

	Animals		Steve's Maze	
	No changes	Changes	No changes	changes
Age				
6-8	8	0	6	2
9-11	4	4	4	4
12-14 + adults	6	5	2	9
Total	18	9	12	15

Table 2a): Changes of answers between first and second session (N=27): Changes by age -group

	Animals		Steve's Maze	
Session	Second		Second	
	3-5 A	0-2 A	3-5 A	0-2 A
First				
3-5 A	18	7	6	8
0-2 A	2	0	10	3

Table 2b): Changes of answers between first and second session (N=27): Changes according the answers in the first session

We observed that, for the first test, a third of the subjects changed the type of response, which is statistically significant (Chi square = 8.02, $p < .01$). The young children (7 to 9 years old), stayed with absolute answers in spite of changes in the instructions and display and half of the older children (ages 11 to 15) and adults changed their type of answer; this difference between age groups is statistically significant (Fisher-Yates, $p < .05$). The same age trend is visible in the second test, for which half of the subjects changed their type of response: the very young children displayed lack of flexibility, while half of the older children changed, as well as most adults; the difference is statistically significant between the younger group and the adults (Fisher-Yates, $p < .025$).

In the first test, with one exception, none of the subjects took over the relative language of the instructions when we asked what they did in order to remember the display. One subject even stated 'well, when you say 'to the right' you must mean *kelod*'.

For the second test, that is more difficult to verbalise, the changes were more pronounced than for the first: 8 subjects out of 14 changed

from absolute answers to relative answers, and 10 out of 13 in the opposite direction (these changes are statistical significant at $p < .01$, Fisher-Yates). Almost all subjects adapt systematically the type of language used for the instructions, in general in a manner consistent with the type of choice used for the second table. Eight subjects adopted the language of instruction without changing the type of response. They stated, for example, 'over there the curve of the path faces *kauh*, and here *kangin*' in order to justify a relative choice after receiving instructions in absolute language.

Numerous subjects experienced a dilemma, a conflict between two possible solutions. One adult stated 'over there the curve was at *kauh*, but here at *kangin*' [relative choice with absolute vocabulary]; 'the belly of the path moved away from me down there, but here, it should come towards me or away from me? I do not know'.

Even if this conflict between the two systems becomes almost conscious, it is never completely explicit. Therefore, there is not a conscious 'choice', but the fact that the majority of subjects above a certain age can change their predominant type of answer indicates the flexibility of possible encoding. At the same time, one can argue that the other subjects resist the suggestion, and maintain their type of answer regardless of the changes in the instructions. A few subjects, instead of allowing themselves to be influenced, even re-enforce the systematic character of their original answers.

Discussion and Conclusion

Our research addresses the old problem of linguistic relativism: to what extent is cognitive functioning dependent on language? The debate has swung through several pendular movements, and is without doubt not closed (Gumperz and Levinson 1992; Lucy 1992). In a recent paper, Li and Gleitman (2002) seek to undermine the large cross-cultural comparison of spatial language and cognition which claims to have demonstrated that language and conceptual coding in the spatial domain covary (Peterson, Danziger, Wilkins, Levinson, Kita and Senft 1998). According to Levinson (2003) the most plausible interpretation is that different languages induce distinct conceptual codings. Arguing against this, the cognitive scientists Li and Gleitman in the tradition of nativism, attempt to show that in an American student population they can obtain any of the relevant conceptual codings just by varying spatial cues, ignoring linguistic variation and the highly variable communication systems in dif-

ferent cultures (for a convincing refutation, see Levinson, Kita, Haun and Rasch 2002).

Berry, Poortinga, Segall and Dasen (1992: 105) summarise the empirical evidence as follows:

"In general, we can conclude that there is at best limited support for the linguistic relativity hypothesis at the lexical level, but the last word has probably not been spoken about this issue. [...] At the grammatical level, [...] the hypothesis that the structure of a language has a broad effect on thinking can be shelved."

It is this type of compromise, of moderate linguistic relativism, that our results demonstrate. In Bali, the system of absolute spatial references is so pervasive that it determines not only forms of linguistic expression, but also ways of representing space, and of encoding for memory. This absolute encoding represents a dissociation from sensory information, that is necessarily relative, which proves its strength. In other words, language and spatial representation are consistent which a strong cultural feature, but this does not mean that language determines thinking.

The majority of subjects, for the first task, and a bit more than half for the second, use absolute encoding. However, they also have at their disposal the possibility of a relative encoding even if it is not normally expressed in current language. In the second test, which does not easily allow a verbal formulation, half of the subjects used this relative mode spontaneously, and for those who reacted in absolute manner during the first session, more than half changed their type of response when the disposition of the display and the instructions motivated them to do so. The reverse change, however, was even easier: 10 out of 13 subjects changed from the relative type to the absolute between the first and the second sessions.

While the 'choice' of a system of coding is to a great extent determined by the context of the task and is not fixed as a personality trait would be, the characteristics of the subjects intervene; certain subjects have a clear preference for one of the systems, and oppose the attempts to 'manipulate' them by changing the context: for example, they followed the researcher in the language used but not in action. For them, the encoding of spatial representation is independent from language.

Amongst these personal characteristics, there is age. The very young children (4 to 5 years old) use only the absolute system in their language, and, as far as we can ascertain from the single test that was used with them, so do they encode spatial objects for memory. This predominance of the absolute system lasts throughout childhood in language, though for

tasks of memorisation there seems to be a trend towards relative solutions, perhaps related to schooling in Indonesian (a relative language), or through increasing contact with western life. Without having been able to include a group of unschooled children, we could not distinguish factors resulting from schooling from factors related to age (the latter can itself contain a plethora of possible influences). While this developmental trend should be verified with a larger number of subjects, the second session showed clearly the progression towards greater flexibility in the use of either one or the other system.

In more recent research in India and Nepal, using the same paradigm, Mishra, Dasen and Niraula (2003) were able to work with larger samples, and to compare schooled with unschooled children (Dasen, Mishra and Niraula 2003), as well as comparing urban and rural locations (Mishra and Dasen, in press). This research confirmed the links between spatial orientation systems, ecology, culture and religion and the development and use of spatial language, links between these and spatial encoding at the group level more than at the individual level, and a link between spatial language (but not frames of encoding) and spatial concept development. Ongoing research is exploring the correlates of egocentric and geocentric encoding, and the possibility of these two frames marking two developmental paths. A follow-up study in Bali explores the influence of acculturation (in terms of urban/rural contexts and use of Balinese vs. Indonesian language).

This perspective leads us to discuss the compromises of this study. For the anthropologist, the number of subjects used in the research is impressive. In comparison with other places where access to a great number of subjects is more difficult, verging on the impossible (e.g. among the Yupno of Papua New Guinea, see Wassmann 1993a), the limitation was mostly a matter of time and means, and a voluntary decision to invest more time in ethnography. For the psychologist, this remains a pilot study, some aspects such as the developmental trends needing a confirmation with larger samples. In relation to the joint management of time during fieldwork, the achieved compromise, from both parts, seems to be ideal: that is, the combination of qualitative 'thick' description, that assures cultural validity, with quantitative data, both linguistic and cognitive, without which this study would have remained at the anecdotal level.

During our previous joint research, the extension of interviews to a relatively large group of subjects allowed us to discover an astonishing inter-individual variety (for the Yupno numeric system, see Wassmann and Dasen 1994b). The observation of daily situations as well as induced situations revealed a social distribution of knowledge and a divergence

between the taxonomic system and its use in daily life (Wassmann 1993b; Wassmann and Dasen 1994a). In this study, the application of our methodology in three complementary phases provided very interesting results. The multiplication of subjects in the linguistic questionnaire allowed us to detect a small differences between the adults from the south of Bali and those of the north with more frequent use of egocentric referents amongst the first, as well as an increase of intrinsic descriptors with age. Extending our inquiry into the daily use of the system especially in the Eastern peninsula of Bali has provided us with some surprises: contrary to the system described in the literature, where only a reversal in the *kaja-kelod* axis between the northern and the southern side of the island is mentioned, we encountered a plethora of different systems, and numerous local adaptations of the system. Similarly, the use of induced situations allowed us to demonstrate that the absolute system obtained by means of ethnographic and linguistic research is not the only one at the cognitive level, where a relative system is also available even if it tends to remain relatively secondary. A controversy that has not been settled is whether the relative, egocentric system is necessarily more 'natural' than the absolute, geocentric one, as many authors seem to believe. In Bali, the geocentric system seems to be learned first; why should it not also be, in this cultural context, more natural?

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