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978-0-521-19105-0 - Development of Geocentric Spatial Language and Cognition: An Eco-cultural Perspective

Pierre R. Dasen and Ramesh C. Mishra

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## Development of Geocentric Spatial Language and Cognition

Egocentric spatial language uses coordinates in relation to our body to talk about small-scale space (“put the knife on the right of the plate and the fork on the left”), while geocentric spatial language uses geographic coordinates (“put the knife to the east, and the fork to the west”). How do children learn to use geocentric language? And why do geocentric spatial references sound strange in English when they are standard practice in other languages? This book studies child development in Bali, India, Nepal, and Switzerland and explores how children learn to use a geocentric frame both when speaking and performing non-verbal cognitive tasks (such as remembering locations and directions). The authors examine how these skills develop with age, look at the socio-cultural contexts in which the learning takes place, and explore the ecological, cultural, social, and linguistic conditions that favor the use of a geocentric frame of reference.

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## Preface

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This book reports a cross-cultural study of child development in Indonesia (Bali), India, Nepal, and Switzerland, particularly in the area of spatial language and cognition. It examines a particular skill that is unfamiliar in Western contexts, which consists of using large-scale (“geocentric”) spatial directions such as north, south, east, and west (NSEW) when talking about the location of objects inside a room. Various ecological and socio-cultural conditions that favor the development of this skill are examined.

The geocentric spatial frame of reference (FoR) was first described and studied in anthropological linguistics by scholars at the Cognitive Anthropology Research Group (CARG) of the Max Planck Institute for Psycholinguistics in Nijmegen, the Netherlands. The findings are summarized in Levinson’s (2003) book *Space in language and cognition*. This linguistic research, carried out through extensive field-work mainly with adults, examined over forty, mostly unwritten, languages spoken in small-scale, traditional societies, languages that favor a geocentric FoR. The argument is that when such a frame is used in language, it will also be used in non-linguistic cognition, such as memory and reasoning. Hence, Levinson (2003) and his group take a fairly strong “Whorfian” point of view of linguistic relativism.

One of us (P. Dasen) was made aware of this research in the early 1990s through Professor Jürg Wassmann, who had spent some time with Levinson’s team, an anthropologist who was interested not only in cognitive anthropology (Wassmann, 1993a) but also in linking it to developmental psychology (Wassmann, 1988). Wassmann and Dasen (1994a/b) had carried out some research together in Papua New Guinea on number concepts and classification, and in 1994 the opportunity arose for a common study of the development of geocentric spatial language and cognition in Balinese children (Wassmann & Dasen, 1996, 1998, 2006). This study raised a number of interesting questions, which the authors of this book tried to tackle in a first study in India and Nepal in 1999–2000, and then again in what we call the main study, field-work for which was carried out from 2002 to 2007. Hence the research reported here has been a long-standing project, and we try to communicate to the reader some of the suspense we have experienced over these years somewhat like a detective

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story. Every result leads to a next question, which is what keeps us going as researchers. But we now feel that we have a coherent body of information, and that it is time to share this in the form of a single volume.

The book is organized in four parts. In Part I, the theory and research questions are presented in chapter 1, which gives us the opportunity to review our understanding of the wider area of “culture and cognition” from a (cross-)cultural and developmental perspective. Throughout the various studies, some of the tasks remained the same to ensure comparability, while some tasks were modified along the way to take more recent developments into account, and still other tasks are specific to particular studies. The methods that are common to several studies are described in chapter 2. Similarly, chapter 3 provides a description of the various locations in different countries, including their relevant cultural and linguistic characteristics.

The second part of the book presents the main results, chapter 4 of the initial study in Bali and the subsequent first study in India and Nepal, and chapters 5 to 9 the results of the main study in different locations, i.e. Bali (Indonesia), Varanasi (India), Kathmandu (Nepal), Panditpur (India), and Geneva (Switzerland).

These chapters have much in common, since some of the research questions and the methods remained the same across locations, but each chapter also deals with a specific problem. Chapter 5 recounts a replication study in Bali, where we went to check on our initial results with much larger samples and more complete methods. The results point to the importance of traditional Balinese culture and language, which help to maintain the use of geocentric language and cognition, while the impact of acculturation through schooling, urban life, and in particular the use of Bahasa Indonesian as a language, contributes to the choice of a more egocentric FoR. In Varanasi (chapter 6), we examine in particular the importance of Hindu religious practices in fostering a geocentric FoR. The study is organized as a comparison of Sanskrit-school and Hindi-school pupils. In Kathmandu (chapter 7), we follow up on one of the findings from Bali, namely the impact of bilingualism with a language that usually favors an egocentric FoR, i.e. English. The comparison, in this case, is between English and Nepali school groups. Research in this location also includes full details of the relationships between using geocentric (G) language and G cognition (encoding) and various socio-cultural background variables. Chapter 8 reports a study in a rural location in India where it seemed that an egocentric FoR was predominant, which turned out not to be the case, and chapter 9 deals with Geneva as a sort of “control” group, i.e. a location in which the geocentric FoR is just simply never used.

The studies in Bali, Kathmandu, Panditpur, and Geneva provide developmental information on a large range of ages, namely 4 to 12 years, while in Varanasi we purposely studied an older group of children, 11 to 15 years. It is

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in this age group that individual differences in the choice between an egocentric and a geocentric spatial FoR seem to be most marked. This also provides us with an opportunity to study in more detail the relationships between using G language and G encoding and other aspects of psychological functioning, such as spatial ability and psychological differentiation.

In Part III, we report a series of additional studies, additional not because the questions they seek to answer are less important, but because these studies are specific to particular locations or samples. Chapter 10 recounts a study carried out in rural Nepal and rural India on mothers' spatial language addressed to children of various ages, from 12 months to 12 years. It is an attempt to describe the linguistic models children hear and learn to imitate. Chapter 11 deals with a study of spatial gestures, using these to guess which FoR young children in Kathmandu use when their language is ambiguous. In chapter 12, we carry out some micro-analyses on how children organize a spatial display depending on the FoR they use. For example, do they use the same description of a display from various positions when they move around it or when the display is rotated? Which schemes do they actually use to subdivide a display of three objects, and how do these change with age in the different groups we have studied?

Chapter 13 deals with neurophysiological correlates of using a geocentric FoR. It examines in particular the role of peripheral and central brain lateralization. It is commonly assumed that differences in neurophysiology cannot be cultural, i.e. these processes are either assumed to be universal, or differences are attributed to genetics. This is not necessarily so. While basic processes are no doubt universal, a diversity in brain functioning may develop through the exposure to particular experiences and practices (Fox, 2006). The question therefore arises whether using a geocentric FoR rests on, or produces, different neural pathways than using an egocentric frame. This is the part of our research, using a split-half visual field technique with children in Varanasi and Kathmandu, that comes closest to laboratory research. It is complemented by an exploratory study with twenty patients having undergone surgery for right-hemispheric brain damage.

In chapter 14, we report a study that seeks to test the limits of how people who use a geocentric FoR are able to carry spatial orientation with them. In this experiment, children in Varanasi were not only able to keep track of cardinal directions inside of a building, but some of them were able to do so even when blindfolded, turned around and led blindfolded to another room. Interviews with these "experts" tried to tease out how this process of dead reckoning functions and how it is acquired.

Part IV of the book is devoted to chapter 15, the general discussion of our results and conclusions. We link these back to an integrated theoretical framework for the cross-cultural study of human development that is presented in



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chapter 1. Our general conclusion is that the development of geocentric spatial language and cognition occurs in a complex eco-cultural system, which is adaptive and functional. The choice between an egocentric and a geocentric FoR is akin to a cognitive style. Consequently, on the basis of a review of the cross-cultural psychological literature and of the results presented in this volume, we argue that cultural differences occur not in the presence or absence of particular cognitive processes, but in the preference for particular cognitive styles.

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