Introducing Postural Dynamics[1]

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[1] This presentation summarizes a discussion that has been published in Heller 1991 & 1997. Revised with the help of Judy Ramsay-Jensen January 2005.

Abstract

I will introduce certain basic notions of the Postural Dynamics *model*, and give a few examples. There is a listing of the postural dynamics *code* used for my study of social status at the end of this paper. Once the principles of the code have been understood, improvements and adaptations can easily be included. Siegfried Frey's team developed the programs that analyze such code. This is a technical paper, with no cosmetics.

1. Introduction[2]

1.1. Movement and position

Although interest in the scientific study of bodily behavior dates back to ancient times, progress in this field has been particularly slow. As Martha Davis[i3] notes, the list of scholars who have studied body movements reads almost like a "*Who's Who* in the behavioral sciences". Nevertheless, for most of those who tried to unravel the secrets of bodily behavior, the topic has proved to be grossly unrewarding: "writers still defend the relevance of such study or introduce the subject as if it were esoteric or unheard of. It is as if a great many serious behavioral scientists have shown a fleeting interest in body movement and then gone on"[ii]. The sad fate of previous research efforts, however, has not deterred scientists from flocking to the issue in great numbers, when in the early fifties bodily behavior was pronounced a major channel in interpersonal communication. This contention, advanced mainly by the anthropologist Ray Birdwhistell, meant a radical departure from the age-old assumption that what one does with one's body betrays one's most secret thoughts and emotions[iii]. The new operational and methodological insights that followed the assumption that bodily behavior should be approached not only as expressing psychological functions, but also as a communicative phenomenon "spurred so much enthusiasm among writers in the field, that within a relatively short period of time the study of nonverbal behavior developed into one of the liveliest fields in psychology"[iv]. The field became an established topic during the '70s, as there was "virtually a geometric increase in such research"[v].

[2] This section has been written with the help of Siegfried Frey. The final result is of course my responsibility.
[3] Roman numbers indicate a reference note situated at the end of this paper.

1.2. Nonverbal communication: movements hide positions

Characteristic of such studies is a certain fascination for the more mobile aspects of bodily behavior. Birdwhistell speaks of "the student of body motion behavior", whose aim "is to become increasingly aware of the apparently endless movement, the shifting, wriggling, squirming, adjusting, and restoring which characterize the living body in space"[vi]. The association between movement and nonverbal communication is so strong that Davis (1972; viii) uses the expression "movement behavior" for a bibliographical review "on body movement style, facial expression, gaze behavior, symbolic actions, gestures, postures, movement interaction..." And Mary Ritchie Key goes so far as to write that "Human communication is body movement." She substantiates this affirmation by associating bodily motion with those movements of the vocal apparatus that result in speech. Everything happens as if there was a dominant feeling that when a person stops moving, he also stops sending nonverbal signals... just as when a person stops speaking, one often considers that he does not want to say anything more.

The myth that the more a part of the body moves the more information it conveys, seems to be related with the idea that communicative channels of a person are related to the head, more than any other part of the body[vii]. This is, of course, true if one considers not only that the head is the part of the body that moves the most, but also that the face contains many sense organs, is the vehicle for speech, and produces specific types of nonverbal signs, such as voice intonation, gaze behaviors and mimics. Nevertheless, there also exists a persistent - although not prevalent - current of approaches to bodily behavior that focus on the more mobile aspects of behavior, possibly diverting our attention from other levels of communication which may be further away from current consciousness, but which nevertheless seem to have a strong impact on human interaction.

For the *I CHING*, a Chinese classic, one needs the whole of one's body to influence others efficiently. When somebody stands, immobile feet already convey a part of what others perceive: "A movement, before it is actually carried out, shows itself first in the toes. The idea of an influence is already present, but it is not immediately apparent to others". At the other pole of the communication spectrum, "jaws, cheeks, and tongue" produce "the most superficial way of trying to influence others... through talk which has nothing real behind it. The influence produced by such mere tongue wagging must necessarily remain insignificant". Influence only becomes efficient if what stems from the feet expresses itself through the face with the support of the heart, related to channels of communication - mainly unconscious - situated below the arms. Furthermore, it is stressed that meaningful communication may only occur when all levels of communication are coordinated[viii].

More recently, Edward T. Hall has shown how the dynamics of interactions are unconsciously influenced by relatively static bodily phenomena such as interpersonal distance, orientation of the body, and posture[ix]. Gregory Bateson summarized the general idea that communication does not necessarily need movements to be conveyed, with an oft-quoted formula: "it never happens that nothing happens"[x]. These less mobile aspects of bodily behavior may be specific or global:

> - S*pecific static phenomena or emblems*[xi]*.* Examples of specific static phenomena are often short: some signs in deaf-and-mute languages, static facial expressions, or coded hand positions with a standard meaning in a given culture such as 'thumb up' meaning 'will live', or

'thumb down' meaning 'will die' (numerous examples of such bodily phenomena can be found in Morris, 1978).
- *Global static phenomena* involve several bodily segments simultaneously, and are often referred to as postural, or "body-base phenomena", defined as those aspects of bodily behavior which are "sustained throughout any interactional sequence"[xii]. Even for those phenomena, one finds a clear reluctance to accept their static aspects: Cosnier and Brossard[xiii] refer to posture as a "slow kinetic" phenomenon; and Rosenfeld (1982) titles his review of methods used to study general bodily phenomenon such as posture and signals: 'Measurement of body motion and orientation'.

Researchers interested in movement know of these phenomena, and sometimes even code them. Birdwhistell's code, which is still the most extensive code of bodily phenomena, contains items for an incredible amount of positional and movement phenomena[xiv]. Although collected in his work as well as in that of many others, positional data remains largely un-analyzed. Referring "to that behavior which is covered by categories like stance, posture, and style", Birdwhistell points out that, "at the present writing, however, most of it defies microkinesic analysis" (p. 109); he then disqualifies these phenomena as "parakinesic" (p. 200). Birdwhistell's puzzled attitude does not seem to stem from difficulties related to the postural phenomena themselves, as similar problems are also mentioned in relation to specific static aspects of behavior. Ekman and Friesen describe their method of coding facial phenomena (FACS) to be as "comprehensive" as possible and able to "distinguish among all visible facial behavior" (1978, p. 2). Nevertheless, Ekman and Friesen also acknowledged that their system helps one to deal adequately with most movements that occur on the face, but "not with other visible facial phenomena. These other facial signs would be important to a full understanding of the psychology of facial behavior, but their study requires a different methodology" (pp. 3-4).

There are two difficulties with static phenomena:

a) Associating static positions with non-trivial communicative functions.
b) Finding a way of relating movement and static phenomena.

Many codes have a nearly schizophrenic attitude of describing static and motion behaviors as if they were completely unrelated. In this also, Birdwhistell's code remains exemplary, as it includes separate items to describe, for example: a) different ways of sitting, b) how a person changes his way of sitting; or a) items to note the position of each body part characteristic of a way of sitting, and b) other coding items to describe movements of these body parts[xv]. The proposition put forth in this presentation attempts to a) show the important functions of posture, and b) how mobile and static elements of bodily behavior form a system.

1.3. Body techniques: positions structure movements

Academic institutions produce some of the most interesting research on the structure and function of bodily behavior. In a presentation of physiotherapeutic techniques developed after the second World War, Ida Rolf presents her field as an amalgamation of the following disciplines: "The physical science of mechanics, in its description of space and material; the chemistry of mesodermal derivatives; the influence of gravity and heliotropic factors on living organisms; the insights of yoga and other ancient methods of physical fitness in theory and

practice all throw light on changes we have observed and documented"[xvi]. Fields such as physiotherapy, which require an ability to influence bodily behavior directly, are singular in their need to combine the most recent scientific findings of physics, chemistry, biology and medicine, with an ongoing development of old methods from Asia such as yoga and martial arts. This second group of disciplines seems to have an unrivaled efficiency in dealing with certain dimensions of human nature, and its connections with bodily dynamics. For some, even today, yoga is "probably the best of the 'exercise systems'"[xvii]. André De Sambucy, an influential physiotherapist in France during the 1950's, created a 'vertebral gymnastic' on the basis of the more recent formulations of biomechanical research. He nevertheless presents his work as relying strongly on the principals of yoga, and recommends strict yoga after a physiotherapeutic treatment[xviii]. Moshe Feldenkrais also finds Asian body techniques, such as yoga, often as efficient as those "resulting from the most up-to-date scientific methods", but points out that more recent methods have the advantage to "admit failure when there is failure and try to eliminate it"[xix]. That such ancient techniques are still currently practiced all over the world, in medical institutions as well as outside, and constantly referred to in the literature by some of today's most eminent practitioners, can be taken as a clear sign of the methodological difficulties mentioned in the beginning of this introduction. It would seem that in this field too, scientific thinking has not yet been able to produce major contributions other than technical ones (better anatomical descriptions, employment of machines, etc.), as "even the most modern methods are vague as how the satisfactory result is achieved"[xx].

The field of bodily techniques has had the time to approach a much greater variety of bodily phenomena than academic studies, ranging in India from the stillness of certain yoga postures, to the great symbolic precision of finger movements and mimics used by dancers[xxi]. Nevertheless, it can be said that bodily techniques have a tendency to associate all bodily phenomenon to posture. Posture is generally perceived as that part of behavior which grounds, supports, regulates and frames specific movements within the field of gravity. Feldenkrais is representative of this trend when he writes:

> All movement, whatever its purpose may be, like closing the eyes when remembering or thinking, is, in the last analysis, an antigravity action. Not only is the ocular globe moved as a mass in the field of gravitation, but the rest of the body is set in a special attitude and is thus maintained against the tendency of gravitation to bring it down. There is little awareness of all this constant adjustment to the very stringent requirements, but the nervous system is constantly and without break, responsive to gravitation, as long as there is any life in it. Therefore, when we speak of antigravity function, we refer to mobility in general. (Feldenkrais, 1981, p. 95)

Michaël characterizes classical literature on Hindu dancing as describing a technique that "calls for complete control of all parts of the body, from the most vital to the insignificant" (Michaël, 1985, xxi). Reporting on the Alexander Technique in his Nobel Prize speech, Niko Tinbergen (1974) describes such an approach as being, in essence, "no more than a very gentle, first exploratory, and then corrective manipulation of the entire muscular system. This starts with the head and neck, then very soon the shoulders and chest are involved, and finally the pelvis, legs and feet, until the whole body is under scrutiny and treatment".

The way posture supports mobility is described well by Franck Ottiwell (1980), in a publication on the Alexander Technique:

> Writing, for example, is not an act of the fingers, or even the hand or arm or shoulder; it is the activity in which you - all of you - are engaged. When you pick up your pen to write, the most obvious and visible aspect of the act is the fingers and

> hand holding the pen. However, with a little awareness, you will notice that a muscular response has taken place in your neck, your back, your legs, your other arm and shoulders. Because the rest of the response is smaller, less immediately and visibly obvious than the gripping of the pen with the fingers, we pay almost no attention to it. If writing tires you, correction of the manner with which your hand holds the pen will only solve a small part of the problem. The question is, what is the response of yourself to holding the pen? If the response is to tighten your neck, to grip one or both thighs, to hold your stomach and chest so that respiration is reduced to a bare minimum, it is clear that the necessary tension and effort to write is being badly organized.

Given the focus on posture, a practitioner will typically look at a moving body upwards, observing how dynamics gradually differentiate themselves from base to extremities. How appropriately global and local dynamics coordinate themselves is often considered a crucial issue, since the field exists. Thousand of years ago, the Taoist sage Chuang Tzu had summarized this view in an oft-quoted aphorism: "The True Man breathes with his heels; the mass of men breathe with their throats. Crushed and bound down, they gasp out their words as though they were retching"[xxii].

One way of comparing the findings of studies on nonverbal communication and those of body methods is to distinguish the issue of understanding current social behavior, and that of understanding the mechanics of bodily behavior. Nonverbal communication studies concentrate on current behavior, but have a poor knowledge of body-logic, while body techniques are not able to work directly with current behavior. Academic studies rely heavily on films that allow one to view a spontaneous gestures many times. Body technics have existed for at least two thousand years. They relied on another way of comparing individual differences, which is the use of standardized positions and movements. By observing how individuals performed a standardized series of positions, their particularities could be described and discussed with colleagues using the same positions. A yoga teacher may ask ten pupils to sit using the lotus position, and then take his time to observe all the specific variants that differentiate each individual. In such a context, posture is easier to observe than movement, even when they are as standardized as those used in martial arts such as Tai Chi Chuan. One drawback of such an approach is that one can only analyze behaviors that have been taught to those we observe. These standardized behaviors are inevitably conceived according to theory. The researcher is thus seldom confronted with unpredictable phenomena, which may partly explain the slow development of the field through the centuries. Such a procedure made it possible to study how people could behave, but never how they actually behaved.

Scanning through any manual may quickly convince the reader that those approaches do not even attempt to study or reconstruct bodily behaviors observed in everyday life, but focus on invented positions, created to explore and teach what knowledge has already been gathered, and which can then be recommended as a form of ideal social behavior[xxiii]. In Far-Eastern combat techniques, for example, protagonists were explicitly taught to use behaviors where posture and movement blend harmoniously:

> In any action the entire body should be light and agile as all of its parts connected like pearls in a thread. ...Sound boxing is rooted in the feet, develops in the legs, is directed by the waist, and functions through the fingers. The feet, legs and waist must act as one. There should be no hollows and projections and no severance, so that when advancing and retreating you can use both your opponent's defects and your own superior position. If you fail to gain these advantages, your body

> will be disordered and confused. To correct this fault, you must adjust your legs and waist. (Man-Ch'ing & Smith, 1981, pp. 106-107)

An implicit admission in this quote, taken from a Tai Chi Chuan manual, is that such a fine coordination may be acquired. Most people do not use such a fine-grained coordination. Having disqualified social behavior as regrettably 'unharmonious'[xxiv], most body practitioners never attempted to study the logic of current behavior; and as the theories used are often backed by quasi religious philosophical options, there is a tendency to suppose that the logic professed by bodily techniques is superior to the 'unharmonious' logic observed among laymen[xxv]. However it is generally admitted in the field of body techniques that the improvements that are taught require a lot of work, and often the development of new forms of concentration. The wisdom of social behavior is thus a mostly unconscious one, while 'harmonizing movement with purpose'[4] requires the formation of conscious capacities that are not available by default in a human being.

1.4. Postural Dynamics: the mechanics of current behavior

Postural Dynamics is an attempt to synthesize the advantages of the two realms of knowledge I have just discussed: body techniques and research on communicative body behavior. It is a proposition that allows researchers to code filmed spontaneous behavior, and then to analyze the data in a grid that takes into account a bio-mechanical model of behavior, and analyzes posture as a coordinated attempt of the organism to deal as comfortably as possible with gravity constraints. The basic assumption is that dealing with gravity is an ongoing basic task that is in the foreground of all other preoccupations. In private discussions, Siegfried Frey has also pointed out that the relation between behavior and gravity is a common human experience that could also serve as a basis for common experiences that can support communication.

In this article, I will summarize the model of Postural Dynamics, as it was designed for a series of studies and explorations that led to my doctoral dissertation on *postural dynamics and social status* (1991). The aim of this model is to propose a way of organizing the information that can be visually extracted from a human body, through dynamics that may have different aims and speeds, while occurring simultaneously.

2. Posture

Birdwhistell[xxvi] uses the word “position” as ‘a statement of the relative position of all body parts in space’ at a given moment. Posture is some times defined in the same way, but it also includes something more, as this word is currently used to differentiate lying, sitting, standing, etc. This distinction implies that the arrangement of body parts in space at a given moment is related to how behavior relates to *gravity* as well as to other constraints.

2.1. Leroi-Gourhan

One way of specifying the particularities of human posture is to consider its history as described by paleontologists. André Leroi-Gourhan (1964, 1965) wrote a particularly enlightening account of how posture participated in a central way in evolutionary processes, and in the history of the human species. He shows how bodily structure, bodily behavior, and culture developed in constant interaction

[4] This expression was often used by one of my Tai-chi instructors, Master Dee-Chow, during the courses he gave near Geneva (Switzerland) during the 1980s.

from fish to men, and from prehistoric times to today. An illustration of his analysis is the way in which he differentiates skeletal types[xxvii]:

> (i) *Horizontal skeletons* (fish, snakes): These skeletons have jaws that must capture, kill, cut and swallow their prey. The rest of the body is used for locomotion. Such a strategy requires immense jaws that weigh about as much as what a spine can carry. The jaw is used to capture food, cut it and make it digestible. This last point becomes particularly crucial for animal that cannot use water to lighten the weight of their jaws, such as snakes that move on rocks.
> (ii) *Horizontal skeletons with legs* (crocodiles, dogs): The spine is higher than the ground, so that the head can droop without discomfort; it does not need to be as tightly attached to the spine. This is of course truer for animals that have longer legs (e.g., it is truer for dogs than for crocodiles). As this evolutionary solution developed, legs diversified their functions. At first they were mostly used for displacement. They gradually acquired the capacity to capture, kill and cut a prey. Because the tougher functions of the jaw are now shared with paws, heavy jaws became useless. Without making heads unduly heavy for the spines, heads could have a larger skull that could contain heavier brains, and more expressive faces. These developments facilitated the emergence of more complex forms of communication and social coordination. Gradually one began to observe that the front and back legs developed differently, allowing the front limbs to become more skilled in the manipulation of objects.
> - (iii) *Skeletons that may choose between horizontal and vertical spine positions*: A wide variety of species, such as monkeys, began to spend increasingly long periods of time with a vertical spine, thus changing in a fundamental way the relation between posture and gravity. Forelimbs became increasingly different from the posterior limbs. Furthermore, head and anterior limbs became increasingly independent. Humans are the first species that only use their feet for displacement, and hands to participate in the killing and cutting of prey. Further more, in the erect position the head is carried by the spine as a stone is carried by a column; while in the lying position (mostly for sleep), the spine is not required to hold the head above the ground for any length of time. The jaws became lighter, the brains bigger, and fine motor skills allowed hands to specialize in an even finer capacity to handle objects. Hands helped by tools not only kill a prey, but also cut it into small manageable pieces. When fire is discovered, food is softened, so that even smaller jaws are sufficient. Now nature has the possibility to develop the brain even more than before. Leroi-Gouhran then describes how the combination between the design of the human body and human cultural propensities combine to form a loop where improvement of tools allows even lighter jaws and bigger brains, which then generate more complex social ways of combining individual capacities. This loop has now, according to Leroi-Gourhan, reached the limits of what can be developed in terms of the relation between strength of spine and weight of the head, but it seems to continuously improve the other dimensions of the system. The clearest difference between humans and other species is the relation between feet and erect posture, and not brain size, as some monkeys have bigger brains than the first humans.

One aspect of this history is a progressive release from the constraints imposed by gravity, which allows organisms to relate to their environment in increasingly varied ways:

> Within a perspective which starts with fish in the Paleozoic era and ends with the human in the Quaternary period, it is as though we were witnessing a series of successive liberations: that of the whole body from the liquid element, that of the head from the ground, that of the hand from the requirements of locomotion, and finally that of the brain from the facial mask. (Leroi-Gouhran, 1964, p. 25)

Culture accelerated this history by producing objects that could improve certain bodily functions, and free them even more from gravity/postural con-

straints[xxviii]. The creation of hammers and screwdrivers improved the capacity to handle objects. Human mobility increased dramatically when they learned to ride horses, float on boats, and fly in airplanes. Some of the most redundant activities related to our capacity to compute and memorize developed through books, and today through computers. Statues, pictures, and now films have completely transformed how the body of a person may contact the senses of another.

These examples illustrate the idea that even if some of our behaviors may have similar physio-anatomical basis with other species, the functions of these units has been drastically modified.

2.2. Structural analysis of communicative behavior

A person's countenance and demeanor can stir up emotional arousal in the perceiver up to the point that it actually grips and tortures the person who is exposed to it.[xxix]

During the 1970's, research tried to describe how perceivers tend to react to a postural organization in standard ways. This movement was sometimes referred to as *structural analysis* of communicative behavior. The innovative idea presented in this literature is that important features of postural behavior do not necessarily "express" inner dynamics of an organism, but they always have a spontaneous predictable impact on others. Because of this effect, postural dynamics is one of the main regulators of interpersonal regulation. Posture frames specific fine motor communicative movements, influences others and participates in the organizational dynamics of a situation[5]:

> Focus of interest is on patterns of behavior and how they are interrelated in interaction, rather than on patterns of behavior as properties of individuals or classes of individuals. ...It is supposed that the interactive functioning of any item of behavior in interaction depends upon its context of occurrence. (Kendon, 1982, p. 442)

Albert E. Scheflen[xxx] describes posture as a way of "framing" reciprocal activities 'in space and time by the way they place their bodies'. For example, he wrote the following comments on a photograph of two people in discussion, facing each other, standing:

> Here, two conversants establish a small territory in which their discourse will occur. To do so they orient their bodies towards each other, look at each other and establish a particular distance. They may defend this communication region from the invasion of others. (Scheflen, 1972, p. 10)
>
> When people carry out reciprocal activities, they "frame" them in space and time by the way they place their bodies. They come together in a sitting or standing posture so that they face each other with their bodies and usually with their faces as well. …Then they will adjust the distance between themselves according to their ethnicity, their level of intimacy, their prior relationship, their business together and the available physical space and circumstance.
>
> …When people finish their activity in a group, they indicate this *by discontinuing the postural frame*. They step back, look down and away, turn out from each other, and go on to other things (Scheflen, 1972, pp. 28-31).

In a conference given at London in 1979 for a *NATO Advanced Study Institute on Methods of Research in Nonverbal Communication*, Ervin Goffman explored the idea of a bodily organization of behavior through a multitude of photographs of public situations. The communicative stance of structural analysis is high-

[5] Ervin Goffman (1979, p. 208) defines the situational dimensions considered in this section as "any physical area within which two or more persons find themselves in visual and oral range of one another."

lighted by Goffman's method of analyzing what can be perceived from a photograph when one has no information on the people who have been photographed. Such inferential processes are regularly used by media and the publicist. One of the central ideas of this conference, as I understood it[6], is the notion that the orientation of bodily segments influences how a situation structures itself, and is a part of how an interaction is framed. In his analysis, Goffman focused mostly on feet, pelvis, chest and head orientations. He distinguished the space in front and behind each of these body segments. What is in front of a segment is what a person seems to be interacting with, while the rest of the space is what a person apparently chooses to momentarily exclude from his attention. For example, Goffman analyzed a photograph of a President of the U.S.A. speaking outdoors. The President was standing on a stage, speaking into a microphone, facing a public who sat lower down on chairs arranged in rows, so that the listeners were themselves facing the President. Next to the President and behind him, also facing the public, were members of the government sitting on chairs that were also arranged in rows, facing the audience. To analyze this situation, Goffman distinguishes several frames: those who have most of their body segments oriented towards the president, and those who have most of their body segments oriented towards the public; those who are higher up and those who are lower down, and the one person who can use a microphone.

The analysis of the President's orientation is easy because it is congruent and consistent: feet, pelvis, chest and head face the public, while the members of the government sit behind all of these segments. In other photographs, Goffman analyzes cases where segments use different orientations. Such cases are referred to as *disjunctions*. Using disjunctions suggests that a person is attempting to coordinate distinct interactive frames. The most important frame for a person is the one that is associated with the part of the body that carries most of the body's weight (feet when standing, buttocks when sitting); the least important is the one which is being looked upon with the eyes. For example, if a person is facing the public with the feet and turns the head towards children playing, observers will spontaneously surmise that this person has only a passing interest in these children at this moment. If the same person orients feet and pelvis towards the children and turns his head towards the public, observers may think that this person's attention is increasingly interested by the children, although he has not quite finished looking at the public.

Goffman talks of appearances only. He states that others spontaneously make these assumptions, but that bodily signals may be more or less strongly associated with a person's real feelings. It is therefore not because a person faces a dog with feet and pelvis that he is necessarily internally focused on that dog.

Kendon and Ferber[xxxi] used segmental orientation to describe how "members of the professional middle-class greeted each other at a birthday party given in a private house in a suburb of New York City":

> EXAMPLE G62: A recently arrived guest, MG, is chatting to the hostess while about ten feet away his host is engaged with another recent arrival, GG. MG, who has been standing with arms akimbo, his hands splayed on his hips, takes a step towards the host, extending his right hand first upwards in a little gesture by which he apparently indicates to her that he wishes to greet the host, and then forward to the host in an offer of a handshake. By the time MG is near enough to the host to grasp his hand, the host has already turned to him, also with hand extended.

[6] In 1981, I checked my description of this conference with Professor Goffman, while he was visiting the Maison des Sciences de l'Homme in Paris.

> COMMENT: Whereas in the examples we have described so far P begins to approach Q, as if on assumption that Q will engage in greetings with him in the examples we shall now describe, P defers his approach until Q has directly signaled his readiness for an approach...
>
> EXAMPLE G44: CB is standing alone with his five year old son, looking out to the sea. Twenty feet away to his left, DW is standing in conversation with HS and, like CB, he is facing the sea. DW's conversation with HS lapses and DW turns his head to direct his face to CB, though he does not turn his trunk or lower body towards him. Shortly thereafter, CB turns his face in the direction of DW and then away again. He then looks at DW again, but this time smiling slightly, whereupon DW immediately throws back his head in a distant salutation. After CB has replied to this with a brief utterance and a much increased smile, DW then begins to turn his lower body and trunk to face CB and approach him...
>
> COMMENT: In these examples, we see P orienting to Q, but not approaching him until Q has oriented his eyes to P. P by his orientation to Q may be said to announce his intention to approach, but he does not do so until Q has given 'clearance'. It is to be noted that in two of these examples, the initial orientation of P is by a turn of the head only, the rest of the body being retained in P's current orientation. This perhaps serves to give the initial move a certain tentativeness. If the other does not offer a clearance signal, P can easily turn his head in an other direction and his look at Q can pass as a mere glance. To turn his whole body to Q is to commit himself much more fully to an approach to him, and this is less easily discounted if he is rebuffed. Correlatively, it is easier to ignore someone who merely turns his head in one's direction, than if he turns his whole body towards one.

In these examples, segmental orientation frames situations, while hand movements and gaze interaction regulate the dynamic that occurs within these frames. The model used for such analysis is summarized by Argyle and Kendon (1967, p. 59):

> We distinguish at the level of general orientation how individuals may adopt a distinctive pattern of activities appropriate for, say, an interview, a cocktail party or a stroll on the beach with a friend. At the level of general method or subplans we note, for instance, an interview may have several phases: an opening 'greeting' phase; a phase in which rapport is established; one in which the main business of the interview may be accomplished; and a terminating phase. At the level of knacks and dexterities, we deal with such things as sequencing of acts of communication. Below this level, we must analyze the actual muscular movements.

This analysis is related to the distinction of *standing* and *dynamic* features:

> - *Standing* features are analyzed through such variables as interpersonal distance, posture, orientation, and interpersonal physical contact which "form the backdrop for a particular flow of events, just as sitting in a particular posture at the typewriter may be said to form a backdrop to the action of typing" (Argyle & Kendon, 1967, p. 62f). These features tend to change at a fairly slow rate.
> - *Dynamic* features are analyzed through those variables that are 'framed' by standing features: specific actions involved in typing for example (eye movements, hand and finger movements...) (Argyle & Kendon, 1967, p. 67f).

2.3. Intra-organism implications of postural dynamics

Other authors have shown that posture has intra-organism implications as well as communicative ones. A topic that has received some attention is the time spent sitting on a chair, which can be considerable in some cultures and professions. Paramedical studies, for example, have tried to understand the psycho-physiological effects of sitting[xxxii]. They observed that people who spend a lot of time sitting tend to have a weaker blood circulation, back problems, more weight

and are often stressed. Certain muscles do not receive appropriate exercise, and tend to become less flexible and restrict the innate repertoire. Members of cultures who sit on toilets and work on chairs often find it difficult to touch their feet when standing with stretched legs, or to squat comfortably.

Before the Second World War, Japanese people had a highly varied postural repertoire for sitting, and few varicose veins; while varicose veins are already frequently observed in societies which use a more restricted sitting repertoire, mostly in professions which impose a single type of posture (always sitting, always standing, etc.)[xxxiii]. After the war, as Japanese people began to use social behaviors often observed in the U.S.A. and Europe, varicose veins increased steadily.

Pierre Bourdieu (1979) shows numerous examples of such mechanisms to point out how different life styles model our beings at the level of our physiological dynamics. He then shows how these bodily distinctions reinforce the differentiations between social groups that produce changes in our life styles. This implies vertical regulation systems, perpendicular to levels of matter.

These are all examples where social rituals directly influence physiological dynamics, without necessarily passing through psychological mediating mechanisms. In some cases the interaction between social and bodily dynamics may be the factor that influences the level of stress of a person. In other words, if one isolates social influences from psychological and bodily ones, one does not necessarily arrive at a neat hierarchy of causal chains. One could expect that psychological factors always regulate the relation between society and body, but that does not seem to be always the case.

Thus, every movement may simultaneously have a physiological, a psychological and a social implication. The physiological price of a job is never included in the computation of a salary, but this price is then paid through medical institutions. Medical institutions tend to require that citizens only use social behaviors that follow physiological requirements, as if they wanted society to become a sanatorium. An important difference between ants and humans is that social behavior does not try to be congruent with physiological requirements (in fact it seldom is). This possibility is probably at the root of whatever freedom humans have, as it allows us to explore a great variety of life styles, and to create social structures in which each individual follows particular dynamics. The immense variety of life styles used during human history would have been impossible if physiological, psychological and social aims had to be congruent.

3. Meaning

There is a persistent rumor that movements convey messages, “using an elaborate and secret language written nowhere, known by none and understood by all"[xxxiv]. My stance is that posture participates in regulation mechanisms that coordinate intra- and inter-organism dynamics. I am not convinced that, apart from explicitly learned sign languages, movements have a “meaning”, or even a clear-cut function.

3.1. Sign language and Levi-Strauss

Structural analysis presents bodily behavior as participating in intra- and inter-organism regulation systems. The issue is not that of meaning. However, many researchers suggest that every bodily item is a sign that can be explicitly associated with a meaning or function, like words. Birdwhistell (1970), for example, even supposed that bodily messages could be analyzed through models that mirrored those used by linguists of the 1950’s to analyze words. Desmond Morris

(1978) photographs bodily items that are known to have explicit meanings and/or functions. Paul Ekman presents a dictionary of facial emotional expressions. The assumption is that some associations between bodily events and meaning are constructed by cultures, but that most of them have a universal innate meaning. The assumption that there exist “natural” meanings that frame cultural interactions has an old history in anthropology that has been explicitly and extensively criticized since the 1950s. For example, Claude Levi-Strauss (1962, a & b) argues against anthropological theories that assume that nature provides signs that have a 'natural' universal meaning. He shows that lions and circles can symbolize a wide variety of phenomena, and that no symbol or natural event is perceived in the same way by all human beings. For example, in North America, certain Indians associated the sun to their good creator, while others associated it to a cannibal monster. A first explanation for this difference is that each culture tends to focus on different aspects of a common figure. To illustrate this point briefly, I shall invent examples, which are simpler than anthropological ones. In one culture, lions and eagles represent the king of earthly beasts and the king of celestial ones. In this opposition one concentrates on qualities such as big, powerful, beautiful, fierce, carnivorous, to form a unit in which heaven and earth are opposed. In another culture, the lion can be contrasted to a green snake to represent the difference between the dangers of the desert and the dangers of the grass. In this case, ferocity and the color of his skin are the aspects of the lion used by culture. Levi-Strauss describes a tribe in which eagles symbolize earth. Their system associates eagles to lightning, lightning to fire, fire to coal, and coal to earth... and therefore eagles to earth.

Levi-Strauss suggests that humans have an inner urge to construct common categories and associations with their neighbors. Myths use already meaningful symbolic entities of a culture in a quasi-arbitrary way to form semantic dimensions. As the culture becomes increasingly complex, it needs to find new associations between objects and meanings. To do this they must choose objects that are not already saturated with meaning. At this stage, one may need to find farfetched links between a sign and a meaning. Signs then acquire their communicational meaning through the dimension in which they are included, and through their capacity to distinguish and coordinate semantic dimensions between them. This process is one of attribution of meaning to objects, not an expressive phenomenon that imposes a meaning to perceivers (Frey, 2001). Human consciousness does not have the capacity to focus on more than three or four items simultaneously, yet an organism is continuously bombarded by a wide variety of stimuli. The function of anthropological habits is to support conscious behavior by coordinating a large number of variables that have been found relevant through experience. A single ritual may, for example, facilitate the coordination of clan rules, marriage rules, economical considerations, food distribution, emotional responses, phenomena related to climate and seasons, etc. A symbolic act thus helps an individual to acquire skills that are *simultaneously* relevant for private, family, social and environmental requirements. The construction of these systems uses all existing devices available for symbolization, natural and social.

One way of summarizing Levi-Strauss’s position is to surmise that items associate themselves to functions and meanings like gene mutations in Darwinian theories. People play with many ways of associating items, and some of these associations survive in a culture for reasons that are not clear for the moment. In this process, items, meanings and functions define each other, so that a cultural choice usually leads to a way of behaving, of perceiving, and of classifying items (Cellérier, 1992 a & b). In those cases where body items can be associated to

certain functions and meanings, one can surmise that they have achieved such associations through a long history of biological, social and psychological selection. My hypothesis is that gravity has been something like a spine in these dynamics. Gravity is the same for all, influences all of us in the same way, and its impact can be felt when a person explores herself through introspection. The implications of gravity on an organism is something that can be grasped by each, and on which individuals have reliably communicated in all forms of social interaction centered on behavior (combat, dance, table manners, etc.). Experiencing gravity is thus a base from which people can find ways of comparing inner feelings that may be based on comparatively similar experiences. Because an experience of gravity can be conveyed through movement, these experiences can be used to refine communication on experiential matters. Similar basically innate tools exist, such as the perceptual tasks (colors, sounds, etc.), and innate devices that participate in emotional communication, or mirror neurons. However, these mechanisms are more complex to calibrate. Comparing feelings between two persons in a psychotherapy session on the basis of emotional expressions is, for example, more complex than regulating sensations linked to gravity in a course focused on posture such as those proposed by the schools of Moshe Feldenkrais, Mathias Alexander, or in a Tai Chi class.

However, the reader may have noticed that the more specific I become, the fuzzier are the contours of what can be conveyed through the body, and the closer we come to structural analysis, which assumes that one needs to replace the notion of body language by a model of mutual regulation (see for example Beebe & Lachman, 2002). I shall now introduce a third way posture can participate in social interaction: regulation of repertoire.

3.2. Repertoire / signals

Although the term repertoire is often used, it does not yet correspond to a model in communication theory. There is a repertoire of eye positions, of facial configurations, of gestures, of postures, etc. Each part of the body can only take a restricted number of clear-cut positions; postural configurations are more numerous, but again not infinite. A postural repertoire is a listing of observed distinct positions in a population. The potential repertoire of the human species is wide, more varied than what one usually thinks. Some postures are more often used than others, some are frequent in certain contexts only, and some are only used for certain lengths of time[xxxv]. I have already mentioned that squatting is a more prevalent posture in Far-Eastern countries than in Europe.

When I enter a German restaurant in Germany, I usually have the impression that most people use an adequate postural repertoire. This impression is often based on a few expected perceptions and fuzzier atmospheric feelings. If I observe what each individual in the restaurant does, I will notice that nearly every body behaves differently. It would require complex data and data processing to determine what sort of repertoire could be considered as 'untypical'. For the moment, theory can assume something similar to Noam Chomsky's (1980) sense that nonconscious processes can rapidly sense-differentiate grammatically correct and incorrect sentences:

> We construct new sentences freely and use them on appropriate occasions, just as we comprehend new sentences that we hear in novel circumstances, generally bringing much more than our knowledge of language to the performance of these creative acts (Chomsky, 1980, p. 222).

What I would like to present is the notion that, for our species, repertoire may often be a more relevant communicational unit than 'signals'. The notion of repertoire as a communicative strategy implies that a person has a sense that certain unspecified behaviors are appropriate, while others are not. *Within* a group, each individual relates differently to the repertoire he has access to. Some repertoires seem to have probabilistic aspects, as in a situation in which some behaviors are possible but not often used. One may find an identical posture in two different situations, but used at a different frequency, or with a different timing. This notion of repertoire rather than specific signals makes sense with current experience for two reasons:

- A notion like repertoire is needed because of the difficulty of reliably associating an explicit set of behavioral items with a meaning or a function. If it were possible, studies on nonverbal behavior would already have yielded more spectacular results than what is published. Communication by repertoire leaves room for a) the fact that something seems to be communicated, b) the fact that there is a difficulty to put one's fingers on what sign communicates what, and c) that communication seems to be only partially reliable.
- Repertoire is related to context. When I put myself in a situation I have a vague notion that this situation has certain requirements, but I seldom behave exactly in the same way in the same situation, or know exactly what I should do in this situation. Burial rituals are partially consciously structured (I am told where to stand, for example), but nobody ever told me exactly how I should behave in such a situation. And yet I somehow have an imprecise feeling of what sort of behaviors I dare use, and ones which I wouldn't even dream of using. Access to repertoire in such a standardized situation as a burial ritual is not quite the same thing as knowing exactly what to do. That only comes by improving with experience and/or training my relation with the accessible repertoire.

The theoretical implications of the repertoire model are close to other contemporary theoretical developments in anthropology such as those proposed by Bradd Shore (1988, 1996), who now teaches in Emory university, Atlanta:

> Conventions are human creations. Their forms and social distribution show a certain degree of free play and indeterminacy. This is one of the reasons human cultures are so diverse and ultimately not reducible to their encompassing material constraints. … They vary within the limits of their constraints, … but within those limits their status is indeterminate. (Shore 1996, p.38)

4. Introducing Postural Dynamics

I have created Postural Dynamics to allow a systematic exploration of some of the themes discussed in the previous sections:

- Postural Dynamics allows a person to code in a reliable way the main items of a postural architecture. The code is digital, so that it can easily be managed by computer programs. To accomplish this I have relied on Siegfried Frey's (1983) *Time Series Notation System*, which provides a system that allows researchers to code the position of all the parts of the body, and then to analyze how these body positions change with time.
- Postural Dynamics includes in its coding procedure a plausible postural architecture, which describes how each part of the body can be situated in the field of gravity.

- Postural Dynamics also proposes items of analysis that are specifically associated to posture's *architecture* at each moment, and the *dynamic* of this architecture in the time dimension.

Postural Dynamics as it exists is a first proposition. Researchers have room to add items that have a particular interest for them. However, it would be useful if researchers always coded the codes mentioned in this article, so that one can compare their data to behaviors observed in other populations.

The code is designed to contrast particular body signals and global architectural dynamics. One can for example distinguish a) positions that differentiated in function of their semiological differences, using the time series code, and b) situate these events in the postural architecture by noting the two codes in separate columns. Programs may then scan the data and find unexpected connections between the semiological and the postural dimensions.

4.1. The architecture of posture

4.1.1. Postural levels

One way of analyzing posture is to focus on how skeletal segments relate to each other. For Birdwhistell such an analysis is insufficient, as it does not take into account that some segments are more 'postural' than others... the more postural elements are related to what he calls 'body base' and 'stance'[xxxvi]. The criterion for distinguishing these phenomena is that (a) they are involved in framing more specific actions, (b) they seem to be related to a basic muscular tone used when muscles are not involved in a specific action, (c) they may remain static (actively or passively) for a long time. This last criterion presupposes a dynamic aspect of posture, related to time; as if the more a part of the body moves and the more it is involved in specific actions, the less it is postural. Thus, a first way of approaching posture is to distinguish a polarity with *parakinesic* body items related to 'body base' at one end and, fine motor *kinesic* activities at the other end. There is thus a continuum in which parts of the body can be more or less strongly associated with Postural Dynamics. For Siegfried Frey, Ulrich Jorns and Walid Daw (1980), Birdwhistell's distinction fits nicely with what can be observed, although what he described as a continuum actually corresponds to four clusters of activity that are distributed on an axis:

> A highly unexpected and surprising finding is the apparent tendency of averaged TSM (time spent in motion) to cluster into four distinct geometrically progressive levels, each level increasing the movement activity by a factor of about three. ...The lowest activity level is defined by a cluster of four parts of the body (right and left upper leg, right and left shoulder) with a TSM value of about one. TSM values for trunk and right and left foot cluster at a level of about three. The third level is that of movement activity of the hands, which reaches a TSM value of about nine. Finally, the head has an average TSM value of about 26, which is again nearly three times higher than the activity level of the hands. These data point to the possibility that the degree to which different parts of the body participate in movement activity is much more highly structured than as thought before. Clearly, the findings need to be verified in a second study, since it is probably the first time that such data has been obtained from empirical investigation of nonverbal behavior.

The Postural Dynamic theory assumes that posture is structured by how an organism organizes it relation to gravity. The more involved a part of the body is, the more 'postural' it is. As no part of the body can avoid participating in this activity, all parts of the body are more or less involved. This organization is mostly based on the dynamics of bodily segments. As shown by Frey *et al*, the task of

managing gravity seems to form well-differentiated clusters of activity. This is necessarily so, if one remembers that the aim of such a flexible organization is to support a wide variety of activities that are constantly adjusting the position of each part of the body to the stringent requirements of the environment.

4.1.2. Differentiating global and specific dimensions of behavior

A classical musical partition can be read horizontally and vertically:

> - *Horizontal* reading focuses on musical phenomena such as melody, which can be defined as an arrangement of single notes played successively.
> - *Vertical* reading focuses on chords and harmonies, which is to say on the organization of all the notes played at a given time. Such a reading is nearly automatically focused on organization, as it will, for example, look for which chords are harmonious or dissonant. Classical music tends to avoid dissonant chords, while Stravinsky systematically avoided harmonious chords when he composed *The Rite of Spring*.

Most studies of nonverbal communication focused on a horizontal analysis of events, noting how facial expressions or gaze participate in an interactive process[xxxvii]. Physiotherapy, on the other hand, still approaches bodily behavior as if it were a classical musical score, in which dissonant chords should be avoided as much as possible. Postural Dynamics has been created to allow a more musical approach to how humans dance their lives, by making it as easy as possible for researchers to have a horizontal and a vertical view of what is happening. This strategy is a helpful way to coordinate specific and global aspects of a series of events. The most specific event possible in such a context is a note played at a given moment, by a given instrument; or the position of a small part of the body (a fingernail) at a given moment. Global analysis will refer to the tonality of a partition (D major in Mozart's *Haffner Symphony*), or the tempi of movements (*allegro con spirito* for the first movement of the *Haffner Symphony*). Similarly one can observe head movements, or situate head movements in general activity of an organism as suggested by Frey *et al* (1983). Condon's (1976, 1984) research was a first attempt to grasp such an organization of behavior:

> A speaker's speech and body motion are precisely and simultaneously synchronized across multiple levels. Further, the listener's body motion is precisely and almost simultaneously synchronized with the articulatory structure of the speaker's speech, and even intimate sounds, within a latency of 42 milliseconds. (Condon, 1984, p. 36)

Condon differentiates a personal and an interpersonal *synchronism*, which has manifest organizational functions: a person may synchronize several movements (e.g., a smile and a head movement) at a given moment, or two people can synchronize their behavior at a given moment (one person smiles while another person moves his hand). Condon's data is usually disposed in a way that closely resembles a musical score, so that synchronism can easily be associated with a musical chord. The studies of Condon and Frey do not lead to a model of postural dynamics, but they show why a tighter model of the organization of bodily behavior could be useful.

4.1.3. .Time Series Notation as a basis to code the postural dimensions of behavior

4.1.3.1. General principles of times series notation

The literature of the 1960's on body communicative behavior clearly showed that there was an urgent need to find ways of scanning, as fully as possible, the bodily behavior of interacting persons. This became possible when Siegfried Frey and his colleagues created the *Time Series Notation System*[xxxviii], which can be presented by stressing the following characteristics.

One of the difficulties with the coding procedures of Birdwhistell, Kendon and Condon is that they produced a set of data that was more complex than the movements they had analyzed. These authors associated a sign with each movement of the hand, each twist of the trunk, different ways of walking, etc. They ended up with a list of signs so numerous they did not know what to do with them. Furthermore, the types of signs they used could not be easily managed by a computer program. The difficulties of coding movement were forgotten when Frey remembered that "movement consists of changes in position over time"[xxxix]:

> Though the changes may be continuous, it is well known that a sequence of static positions (e.g., the 16 frames per second of movie film) provides an adequate equivalent to the fluid movement, as far as our eyes can discriminate. The problem of coding movement can therefore be reduced to the problem of coding static positions, a much more manageable task. Our approach, therefore, has been to develop a system of notation which discriminates the positional states recorded in a still photograph. A frame-by-frame protocol using this notation then corresponds to the information on visible movement present in the film or video record. (Frey & Pool, 1976, p. 9-10)

The procedure proposed by this system is to code the position of each part of the body at regular time intervals (e.g., every half-second), using numerically defined positions. On the basis of this data, programs may easily compute every quantitative aspect of the observed movements (their occurrence, direction, speed, accelerations, etc.), and produce graphic representations to highlight more qualitative proprieties.

With such a system one can easily code what every part of the body does in a manageable way, and take "the exhaustion of the data stream as a cardinal rule"[xl]. The system is therefore designed in such a way that specific measures (the behavior of each part of the body), and global measures (for example, the number of visible movements produced by a body) can be computed and then analyzed.

4.1.3.2. A time series matrix for postural behavior

The standard way of organizing a data matrix, is to put all the phenomena that occur at a given moment on the same line and all the variants of a single variable in the same column. This allows horizontal and vertical (in the musical sense already defined) reading of bodily behavior.

An example of data matrix used for the analysis of postural dynamics :

```
0        1         2         3         4         5         6         7
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456
H1DR1505              99D9C5D5C3EE11878811D391E1ELE9DDD9DDD888888888D3E22220
H1DR1510              E9E995D5C3EE11878811D391E1ELEEEEEEEEE888888888D3E22220
H1DR1515              9959555533EE11778811C391E1ELEEEEEEEEE888888888D3E22220
H1DR1575              9959555533EE11778811C391E1SECEEEEEEEE888888888D3E22220
H1DR2230              E9E9E5E533EE11778811D391E1SECEEEEEEEE888888888D3E22220
H1DR2235              E9E9E5E593EE11778811D391E1SECEEEEEEEE888888888D3E22220
H1DR2240              9959555533EE11778811C391E1SECEEEEEEEE888888888D3E22220
H1DR2260              3999959533EE11778811C391E1SECEEEEEEEE888888878D3E22220
```

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H1DR2455              9959555533EE11778811C391E1SECEEEEEEEE888888888D3E22220
H1DR3115              3999959533EE11778811C391E1SECEEEEEEEE888888878D3E22220
H1DR3270              9959555533EE11778811C391E1SECEEEEEEEE888888888D3E22220
H1DR3280              9959555533EE11778811C391E1ENSEEEEEEEE888888888D3E22220
Column 1: H for Heller. Columns 2-4: code name of a subject. Columns 5-8:
time. Columns 23-76 contain all the positions distinguished by a coding
system for each column (the present code is described in annex II). A = 10,
B = 11, C = 12, D = 13, E = 13.
```

Each line provides information on all the events that occur at a given moment (harmonic reading), each column provides information on how a given item evolves during an experimental situation (melodic reading)[7]. Computations using the particularities of the data matrix taken as a whole allow one to obtain global information. For example, by computing the number of vertical changes that occur, one can gain information on the number of changes that occurred in the bodily phenomena coded above.

Although the possibilities that the system offers for postural analysis were immediately apparent[xli], the system was mostly developed to analyze "spontaneous movement of people communicating"[xlii]. The code published in relation to the Time Series Notation was designed to analyze global movement (time spent in motion, complexity of body movement), specific movements, and positional communicative strategies (head positions)[xliii]. Designed for such studies, the code does not contain the items required to situate an action in Postural Dynamics. The postural code summarized in annex II lists the columns that can be added to Frey's Time Series Notation System so as to allow a) a fine description of movement that is b) situated in a postural architecture.

4.2. Base, connecting and surface postural dimensions

The *Postural Dynamics code* used in this study is based on the idea that one should be able to distinguish at least three postural levels: one relates to 'body base', a second level groups body parts which can perform fine motor movements as freely as possible, and a third intermediary level covers auto-contact. The first level distinguishes the basic ways of dealing with gravity (sitting, standing, lying, squatting, etc.), the second level allows one to differentiate different configurations within each of the basic categories (different ways of sitting, standing, lying, squatting, etc.), while the third level describes variants of each postural type and purely melodic activities.

There exists no systematic list of the human postural repertoire, and therefore no standard way of labeling postural types or dimensions. As I could not avoid using a form of labeling to deal with my data, I used terms that are employed in current language and that have some relevance to the criteria I chose to define each postural dimensions. I hope that my semantic choices, which are as unpretentious as possible, will not distract readers from the main issues discussed in this study.

The three postural levels distinguished by the postural code are the following:

- DISPLACEMENT. This dimension is not needed when analyzing face-to-face interactions of people who sit, but a person's life process can be described by locating where the body's weight is situated at every moment.
- BASE POSTURE OR SUPPORT SURFACE. A body is supported by a surface (a floor, a chair, etc.). This is the support surface. All the parts of the body that touch that surface form base posture. A person who walks typically touches the

[7] I prefer to speak of harmonic and melodic readings, as in this case what is horizontal in a music score is vertical, and what is vertical is horizontal.

ground with the feet, while a person who sits will usually set the buttocks on the chair and maybe other parts of the body (e.g., back on the back of the chair, one or two feet on the ground, etc.). Base posture also includes the axis of the body: a person who lies on a bed has a horizontal axis, a person who stands a vertical axis. The axis is the line that passes through the ankle, pelvis, shoulder and ear of a profile of the body. The axis is not necessarily symmetric.
- CONNECTING POSTURE. The literature provides abundant reasons for distinguishing base posture from specific actions, but much less thinking on this intermediary region has been produced. Yet, empirical evidence shows it is often the part of postural dynamics that involves the greatest number of body segments. I have called this dimension 'connecting posture' to stress the fact that one of its most obvious functions is to connect base to specific actions.
- SURFACE OF POSTURE. This postural level includes all bodily phenomena that are not included in the two other levels. These items differentiate marginal aspects of posture only, as they constitute the interface between posture and specific actions.

The need to distinguish these three postural levels does not only stem from an analysis of the literature. Having tried several ways of including biomechanical principals into a coding procedure that can be used to study current behavior, this distinction was the only one that did not lead me to a dead end. The relevance of this solution is, of course, relative as it is based on the assumption that I had to find a way of coding that could not benefit from the more sophisticated measures used in biomechanical studies, as they would inevitably interfere with the observation of spontaneous behavior. In the future, technology might solve some of these discrepancies between theory and what can be coded. One could, for example, imagine a chair that weighs the contribution of all the parts of the body that touch the chair. The heavier the part, the more central it is to basic posture dynamics. Siegfried Frey once used such a chair, but did not find a useful way of utilizing it[8].

I have only studied situations in which subjects were seated, explaining why most of my examples will relate to sitting; but the *Postural Dynamic Code* is designed to describe all postures. Such a claim assumes that minor modifications may be required for studies that focus on a wider repertoire. I shall now give a more detailed description of each postural level.

4.2.1. Displacement

Some people remain in a small area all their life, others have traveled all over the planet for most of their life, and a few people have walked on the moon. Being where one is at a certain moment is probably a person's most basic statement, because it is indicative of the choices that an organism has made. I will not discuss this dimension in this paper, because I am reporting on a study of people who remain seated. However this dimension can become relevant in other situations (Heller, 2004).

4.2.2. Base posture

Base posture is that part of bodily behavior which is mostly involved in regulation of how gravity impacts an organism. This necessarily implies the analysis of at least two dimensions: a) how the body's *weight* is distributed (base), and b) how the centers of gravity are *aligned*.

[8] Personal communication.

4.2.3. Basic surface

The rationale for describing base surface is provided by classical mechanics and the three laws of Newton: the weight of an object is a force produced by its mass and gravity. Forces are normally computed as vectors, starting at a given point. A weight vector is vertical. It begins at a theoretical point defined as the *center of gravity*:

> In physics, the weight vector is an imaginary point in a body of matter where, for convenience in certain calculations, the total weight of the body may be thought to be concentrated. The concept is sometimes useful in designing static structures (e.g., buildings and bridges) and in predicting the behavior of a body when it is acted on by external accelerating forces.
>
> The location of a body's center of gravity may coincide with the geometrical center of the body, especially in a symmetrically shaped object composed of homogenous material. An asymmetrical object composed of a variety of materials with different masses, however, is likely to have a center of gravity located at some distance from its geometrical center.[9]

If one excludes dynamics of air, water and space, a solid object can only remain static if the part of the object directly under the center of gravity touches a surface solid enough to support it. The supporting surface is usually referred to as 'support surface', while the part of the object it touches is called 'contact surface'. If a ball is static on a table, the contact is a point, immediately under the ball's center of gravity. A ball is not designed to be stable. Its instability is explained by the fact that only a small surface is used as a contact surface. Stability increases in function of two variables:

- If the support surface widens.
- If the center of gravity is closer to the ground.

These laws apply to human posture:

- When a human organism lies on a mattress, it uses the largest possible contact surface, and has the lowest possible center of gravity. It is the most stable posture, and therefore the one that requires a minimum effort to regulate the organism's relation to gravity, and therefore the most comfortable position for low arousal states such as sleep. When an organism lies on its back, each segment rests on the support surface, which is why one tends to compute a center of gravity for each body segment.
- When a human organism stands up, it uses a small contact surface, has the highest possible center of gravity[10], and therefore requires constant monitoring of postural dynamics. The main function of such base postures is displacement. One usually computes only one center of gravity for a standing person.

There seems to be a positive correlation between an impression of 'inner activity' and the number of centers of gravity. For example, when a person sits without touching the chair with her back she appears to be more active than when the back is supported by the chair. This last example can be used to illustrate the difference between a biomechanical and a communicational approach to bodily behavior. For Mehrabian (1969), forward and backward leaning are signs of

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[10] "For a standing male, the centre of gravity lies about 2.5 cm below his naval or about 57% of his full height from the ground; while for a standing female, the centre of gravity lies about 55% of her full height from the ground due to a heavier pelvis, lighter thorax, arms and shoulders. Growing children have more weight in the upper part of their bodies and so their center of gravity is more like 60% of their full height. This still gives them a lower center of gravity than adults when standing side by side." (Page, 1978, p. 31)

submission or dominance. Mehriban analyzes the position of the trunk as a sign, that can be perceived independently from its organismal ecology. For a physiotherapist, forward and backward lean have a deep impact on an organismal ecology, as these positions have an influence on breathing, the tonus of back muscles and weight distribution. If a person's back touches the chair, the weight of head and arms is transferred to the support surface via the back. If the person leans forward, the weight of the upper half of the body is transferred by the spine to the support surface through the pelvis and the feet. There are more centers of gravity in the first base posture than in the second. Even if legs have not changed position when a person leans forward, their function is mechanically different.

I tend to use the expression of "base surface" instead of "contact surface" when I write on this postural dimension, because "contact" is a term which is often used in psychology with other meanings.

4.2.4. Postural beams

To understand what I call postural beams, please sit on the edge of a chair in such a way that only the feet touch the ground and the legs do not touch the chair. Base surface consists of four parts of the body: the two halves of the buttocks and the two feet. However, although the legs cannot be coded as a part of base *surface* they are nevertheless a part of basic *posture*. They are not involved in auto-contact, they are not using their capacity for refined motor activity as in dance, and they are definitely involved in distributing a part of the body's weight through the feet. They have the same architectural function as beams in a house.

4.2.5. Anchoring and balancing points

To evaluate relation between base surface and beam requires another distinction: that of anchoring and balancing points:

- *Anchoring points*: Anchoring points are those parts of the body that carry most of the body's weight and which participate in the characterization of a base posture. For a standing person, anchoring points are his feet; for a sitting person, anchoring points are buttocks and eventually thighs and/or feet.
- *Balancing parts*: All parts of the body that touch support surface, but which can not be considered as anchoring points, are defined as balancing parts. Their function can be understood, from the point of view of weight distribution, as balancing the body's weight around anchoring surface; they are much more mobile than anchoring points

4.2.5.1. Location of anchoring

A man may be standing, leaning forward, his feet near a chimney, one hand just touching a table situated a meter away from the chimney. This man is essentially located within a square meter of floor, near the chimney. Location of anchoring thus situates where a person is. When analyzing relations between people sitting on chairs, location of anchoring can be subdivided by noting a) the location of the chair, and b) on which part of the seat a body anchors itself.

4.2.5.2. Mode of anchoring

An anchoring point is not only anchored somewhere, but also in a certain way. Mode of anchoring is the way in which an anchoring point is positioned on its support surface. This variable is not usually mentioned in studies on nonverbal communication. An exception is Birdwhistell's[xliv] observation that "the American male tends to carry his pelvis rolled slightly back as contrasted with the female anterior roll". On the other hand, this item is often discussed in bodily techniques. From a biomechanical point of view, 'correct' sitting presupposes that the base of the pelvis is as stable and as wide as possible. Technically this implies that one is sitting on ones' ischia bones[11], in such a way that the perineum[12] nearly touches the seat[xlv]. According to these authors, this position is ensures a "good" position up to the waist, and is the only position of the pelvis that does not hinder breathing movements involving the lower abdomen:

> In its role as basin, the pelvis contains the abdominal viscera. This offers a clue as to how it must be balanced in space to perform effectively. ...In a tipped pelvis, viscera may be restrained by the abdominal wall, but they cannot be housed within the basin. When the pelvic contents overflow, the overlying abdomen becomes either the little round 'potbelly' or the more diffuse 'bay window' (Rolf, 1977, p. 87).

This pelvic tilt is also "related directly to the position of the lumbar spine and sacrum", and thus "forms a mechanical bearing on which the upper body balances"[xlvi].

In their practice, body specialists also require that when one uses this position one tries to avoid, as much as possible, to decrease the inward curve of the spine above the pelvis. It would seem that sitting on ischia is common in most cultures that often use squatting postures and sit on the ground[xlvii]. In Europe and North America many people find it difficult and/or uncomfortable to sit this way, as some of the muscles involved[xlviii] tend to be chronically tense. Typically, the adults I know tend to anchor on their coccyx, or even on the lower back, when they sit. This last position creates tensions in the lower abdominal muscles that partially inhibit breathing responses in this region. Yet, when one looks at Gesell's atlas of infant behavior[xlix], one notices that even in these cultures children at first spontaneously sit on their ischia bones, and sit straight.

Given the above considerations, I do not expect this variable to be sensitive to variables such as socioeconomic status within a culture; but I have nevertheless included it in my analysis because it is an essential element of anchoring when seated. An equivalent discussion exists for the feet of people standing[l]. This variable can only be coded by filming the profile of a person.

4.2.5.3. Anchoring orientation

Anchoring orientation is the orientation of the anchoring point. The relevance of this variable has been discussed in my review of Goffman and Kendon. The rationale is that what is in front of this part of the body is often correlated with a person's official long-term situational intention. The meaning of long-term situational intention is that the orientation of an anchoring point structures the situation and the goal of an interaction. If I sit at a table in a restaurant, and orient my pelvis towards the table, I am creating a situation that allows others to suppose that I intend to eat at this table. If another person already sits at this table,

[11] The ischia bones are the pointed bones that can be felt on both sides of the anus.
[12] The zone that is half way between sex and anus.

I am allowing this person to surmise that I intend to eat with this person. The dialogue between several persons' anchoring point location and orientation frames whatever interaction is going to occur. To continue with the restaurant example, if, once I am seated, the person who was already sitting at that table gets up and sits at an other table or walks out of the restaurant, I am entitled to assume that this person did not want to share the table for this meal. If we are lovers quarrelling, my girl friend may hope that I will run after her. This is an example of an interaction analyzed from the point of view of base posture dynamics, in which I assume that facial mimics may only activate micro-regulations of whatever is being negotiated through basic postures.

4.2.5.4. Alignment

Measuring how a body adapts to gravity as it moves is a complex and costly business, requiring heavy machinery and computations[li]. Such measures cannot be used in current practice. A physiotherapist will usually evaluate chronic adaptations to gravity by looking at a body's alignment, which requires an analysis of the profile of a standing person:

> When the body is in standing equilibrium, the centre of gravity is just above and half way between the anterior superior iliac spines; a vertical line dropped from the centre of gravity passes just in front of the knee and ankle joints, and touches the ground within the area between the feet - the underpropping area. (Feldenkrais, 1981, p. 103)

Rolf (1980, p. 94) describes this procedure in the following way:

> It has long been recognized that in an erect person, certain spatial relationships are normal. The problem has been to evolve a technique through which they could be restored or evoked. Thus, in an erect person it should be possible to draw a straight line through the ear (dissecting the external meatus), the shoulder (head of the humerus), hip bone (head of the femur), knee and ankle (external malleolus). If this idea of a one-dimensional line is expanded to three dimensions, the body appears as an aggregate of blocs (head, thorax, pelvis, legs) which must be staked in a stable fashion before this line can appear.

When this viewpoint is deemed relevant, one assumes that any deviation from this axis designates chronic (mis-) adaptation to gravity, such as shortened muscles, deviations of the spine and restrictions of available breathing patterns. The mechanics behind this idea are fairly simple to grasp, if one remembers that a tense muscle is by definition a shortened muscle. If back muscles are chronically tense, they may prevent the spine from lengthening when a person attempts to lean forward, and may even shorten it and maintain it twisted (creating lordosis, scoliosis, etc.). In such cases, a chronic deviation of the piling-up of segments inevitably occurs[lii]. Alignment can also be related to erectness measures[liii][13].

Base surface can be used to differentiate most of the basic postures (those described by Hewes in 1955, for example), but not all. An important exception is the differentiation between standing and squatting. In both cases, only the feet participate in the anchoring surface. To differentiate these two postures, one can

[13] Jones, F.P. (1976, pp. 106-137) describes more complex procedures of alignment analysis, used in experimental situations designed to study a) the difference between "ideal" and "normal" postures, and b) the difference between "ideal" and "normal" postural dynamics.

use alignment: the profile of hip joint and knees are of approximately 180 degrees for a standing person and less than 90 degrees on average for a skating person. These differences can easily be related to different relations between base and center of gravity, as the center of gravity (located in the belly) of a standing person is at a height that is approximately twice the distance between feet and knee, while in a squatting person the center of gravity can be lower than the knees[14].

4.2.5.5. Pelvic angle and trunk inclination

Differentiating standing and squatting postures shows the importance of considering the angle formed at the pelvis by legs and trunk. It is closely related to the center of gravity. For example, standing with a pelvic angle of 180° (standing straight) is very different from standing with a pelvic angle of 90° (when bowing).

To measure the pelvic angle of my subjects I used a device created by the Faculty of Psychology in Bern in the laboratory of Siegfried Frey, in the 1980's. The device is designed for films of profiles. It allows me to situate on a picture three lines:

- line 1 passes by *pelvic and shoulder articulations*;
- line 2 passes *horizontally through the pelvic articulation*;
- line 3 passes by *pelvic and knee articulations*.

Once these three lines have been correctly placed, pressing a button permitted a computer to record the following information:

- *Time*;
- *Pelvic angle*: the angle between lines 1 and 3;
- *Inclination of the trunk*: the angle between lines 1 and 2;
- *Inclination of upper leg or thigh*: the angle between lines 2 and 3.

For that study, I could only film my subjects' profile with one camera. I could therefore not code the asymmetries of the upper leg inclinations. Line 3 used the highest visible knee as being the knee through which to pass to measure pelvic angle. But leg angular behavior really requires that both profiles be analyzed.

The following distinctions of trunk inclination are often used to analyze the behavior of seated people:

(i) Sitting *leaning forward*: trunk inclination < 90°.
(ii) Sitting *straight*: trunk inclination = 90°.
(iii) Sitting *backwards*: trunk inclination > 90°.

4.2.6. Base posture functions

The main features of base surface are the following:

- Base surface is organized to prepare the organization of connecting and surface postures.
- Base surface is an important component of a situation's structure.
- Base surface organization also takes into consideration chronic adaptations to gravity (the shape of the spine, muscular tensions, etc.).

[14] These measures are those used in a practice, but can be refined *ad infinitum* and *ad nausea* if one has the right sort of instrumentation.

The main features of the body's profile distinguished by the postural code are the following:

- Profile analysis also takes into consideration chronic adaptations to gravity (the shape of the spine, muscular tensions, etc.).
- Profile analysis evaluates the relation of center of gravity with base.
- Profile analysis evaluates how connecting and surface postural dimensions relate to basic surface.

Contemporary literature on the inclination of the trunk seems to be variations on William James' (1932) study:

> James used photographs of a masked male model as stimuli. He asked Ss about the attitude being expressed by each posture and the portions of the posture which were significant. He used 347 photographs in which the position of head, trunk, feet, knees, and arms were systematically varied – certain combinations being eliminated due to their awkward quality[15]. He selected thirty of these photographs on the basis of the highest agreement among his three Ss' judgment of the attitude being communicated. Two additional experiments in which Ss interpreted the set of thirty selected postures yielded the following four postural categories: (a) approach, an attentive posture communicated by a forward lean of the body; (b) withdrawal, a negative, refusing or repulsed posture communicated by drawing back or turning away; (c) expansion, a proud conceited, arrogant or disdainful posture communicated by an expended chest, erect or backward leaning trunk, erect head and raised shoulders; and (d) contraction, a depressed, downcast or dejected posture communicated by a forward-leaning-trunk, a bowed head, drooping shoulders and a sunken chest. For each of these four generic categories, the head and trunk positions were found to be the most important indicators. …In his third experiment, James (1932) found that postures were generally interpreted in the same way whether S viewed the posture and interpreted it or whether S viewed and imitated the posture and then interpreted it. (Mehrabian, 1968).

4.3. Connecting posture

The posture of Rodin's *The Thinker* can be briefly coded in the following way:

- Anchoring point is pelvis on the edge of a chair.
- Feet touch the ground.
- Right elbow rests on the right thigh.
- Chin rests on the palm of the right hand.
- Left hand rests on left knee.
- Trunk leans forward.

Support surface touches feet and buttocks, while legs are used as a base beam construction. None of these features characterize *The Thinker's* posture: The head's weight does not pass so much by the spine, but is transmitted to the right leg through the right arm. This is a construction on top of base – such as a floor in a building. Such a "construction on a construction", which creates a second layer in a postural architecture, is what I call *connecting posture*. This layer does not exist when one plays the piano; but at other times, it may involve many parts of the body, as is the case with Rodin's *The Thinker*. Whereas base posture can be described in terms of parts of the body touching support surface, connecting posture can be described in terms of parts of body parts touching each other.

[15] This is an example of a reaction which can be associated to Chomsky's hypothesis that people have an innate mechanism which can immediately spot whether a sentence is correct or not.

4.3.1. Connecting posture variables

4.3.1.1. Auto-contact surface

Auto-contact surface is composed of all parts of the body touching other parts of the body. This definition covers a wider range of phenomena than what is usually referred to in the literature as auto-contact. Morris (1978, p. 102) for example, mentions the following aspects:

> If we stroke, clasp or hug, we are not invading someone else's body-privacy and we think little of it. But the unconscious way we employ self-touching does not mean that they are unimportant or meaningless. On the contrary, it means that they can provide genuine, uncontrived clues concerning our inner moods.

When researchers analyze auto-contact, they tend to focus on fine motor auto manipulations[liv], which are often considered autoerotic or manifestations of anxiety. Rosenfeld (1982, p. 267) summarizes the general attitude of ethological studies on auto-contact, when he associates auto-contact to "negative emotional states":

> The self-contact actions have been referred to by many labels, including synkinetic movements, autistic movements, body-focused movements, self adapters and body manipulations. ...The movements have been found to increase in response to experimentally induced withdrawal of socially supportive nonverbal behavior; and their rate of occurrence has been found to be correlated with ratings of anxiety, guilt and deceptiveness, as well as disapproval.

Similarly, Feyereisen and De Lannoy (1985), writing on auto-manipulations (p. 38), focused their attention on hands touching nose, scratching skin, touching lips, etc. These gestures are referred to as being "quasi-autistic" (p. 84). It would seem that connecting posture phenomena have a bad reputation: they group the aspects of bodily behavior on which hardly any theory exists, that are usually analyzed in a more simplistic way than base and surface phenomena - and when they are studied, they are mostly negatively perceived. Everything happens as if most approaches of bodily behavior elaborated in human societies attempt to ignore auto-regulative aspects of behavior, and to disqualify them when they cannot avoid them.

The only domain in which auto-contact is viewed favorably is in studies of child development, where auto-contact is a form of auto-regulation, and a way of exploring one's body for constructing the contours of the self[lv].

Auto-contact has only been approached as a specific bodily item, while the more general coding approaches such as Frey's and Birdwhistell's "excludes, or at least minimizes, touch"[lvi]. Once again physiotherapists do not deny the importance of auto-manipulations, but they tend to focus on auto-contact as way of transferring the weight of one part of the body to another, or of regulating physiology. Both views seem to associate auto-contact with forms of auto-regulation, but physiotherapists consider a wider range of auto-regulative issues.

Auto-manipulation is a subcategory, related to frictional forces, of auto-regulation strategies. Coding auto-contact is more complex than base surface because several parts of the body may be simultaneously involved. For example, a finger may touch the skin of the face and some hair simultaneously. This requires a table with several entries which cannot be easily fitted in a coding matrix such as the one currently used for Time Series Notation. In infant psychol-

ogy, auto-contact is sometimes referred to as *doubletouch*[lvii]. I have not heard of a complete coding strategy for auto-contact, and what I propose is only a hopefully elegant short-cut that should be completed in the future.

4.3.1.2. Connecting beams

Certain parts of the body do not touch the body, but they connect two parts of the body that are in auto-contact. These I call connecting beams. Rodin's *The Thinker* has a chin that rests on the knuckles of his right hand. The weight of the head is then transferred to the forearm, which touches nothing, and then to the right elbow, which is supported by the upper right thigh. In this example, the right forearm is a connecting beam, as it is situated between two parts of the body that are in auto-contact: right hand and elbow. This beam can also be perceived as a shield or a barrier that passes in front of *The Thinker's* throat, trunk and sex.

4.3.1.3. Ventral auto-contact surface

Morris'[lviii] notion of 'protective behavior' summarizes the notion of a 'reflex' protective behavior that arises when humans are attacked by stronger opponents from whom it is impossible to flee. He distinguishes a 'softer/more vulnerable' part of the body from a 'harder/less vulnerable' part of the body. The softer part of the body is composed of throat, thorax, belly and sex[16]. The harder part is composed of skull, neck, back and limbs. When attacked, humans tend to protect the softer parts by putting themselves in fetus-like positions, arms and legs in front of the softer regions, exposing mostly the back of the body, and - vegetatively - by reducing blood flow in periphery. The aim of such a reaction is to protect as much as possible the vital organs and lessen blood flow in case of wound. This 'softer part of the body' situated below the chin is what I call v*entral auto-contact surface.* This fragile part is oriented towards the ground in mammals.

Morris' protective behavior can be opposed to what Morris calls triumph displays, where one faces crowds with the softer parts of the body widely exposed. He[lix] also describes "barrier signals" which are finer manifestations of protective behavior:

> People feel safer behind some kind of physical barrier. If a social situation is in any way threatening, then there is an immediate urge to set such a barricade. For a tiny child faced with a stranger, the problem is usually solved by hiding behind its mother's body and peeping out at the intruder to see what he or she will do next. ... (By the time we are adult, similar) actions are still there, but they are transformed into less obvious movements and postures.... The most popular form of barrier signal is the body-cross. In this, the hands and arms are brought into contact with one another in front of the body, forming a temporary `bar' across the trunk, rather like a bumper or fender on the front of a motor car.... There are variations on this theme. A male may finger a button or the strap of a wrist watch instead of his cuff. A female may smooth out an imaginary crease in a sleeve, or re-position a scarf or coat over her left arm. But in all cases, there is one essential feature: at the peak moment of nervousness, there is a body-cross, in which one arm makes contact with

[16] One could include the face in this distinction, but many people tend to associate the term « body » with everything but the head.

the other across the front of the body, constructing a fleeting barrier between the guest and the reception committee.

Mehrabian (1968) distinguishes *opened and closed* postural attitudes. A posture is open when the ventral surface is visible for others. The degree of closing is computed by the number of parts of the body that are in front of the ventral surface. Rodin's *The Thinker* is an example of a closed posture.

There are three types of codes which can be used to evaluate how arms and hands participate in closed postures:

1. Parts of the arms or hands touch the ventral surface. This is detected by coding auto-contact.
2. Hand, arms or objects are situated between the trunk of the subject and others, but do not touch the body. This is detected with Time Series Notation, and sometimes by the coding of auto-contact beams.
3. The smaller the pelvic angle, the more closed the posture is.

4.3.1.4. Chest orientation

Chest orientation is analyzed a) in relation to the orientation of the anchoring point, and b) in relation to protagonists. Mehrabian (1978) reports that, in situations he observed, "Head- and shoulder-orientation measures correlate 0.93 with each other and correlate -0.43 and -0.41 with eye contact, respectively. ...There is one significant effect due to addressee status. There is a more direct shoulder orientation to a high status addressee than to a low-status addressee." (Mehrabians' code is given in annex I).

4.3.1.5. Torsion of the trunk

Torsion of the trunk is measured by the absolute difference between the orientation of the pelvis and the orientation of the shoulders. In studies on interpersonal regulation mechanisms, such as those of Kendon and Goffman, one distinguishes cases when head, shoulder, pelvis and feet were oriented towards the same person and cases when there was a 'disjunction', that is to say when all the segments where not directed towards a single person but pointed to several different persons. In such a case, they considered that several situational units were coordinated posturally. If trunk and shoulders are oriented in the same direction, tension in the spine is minimum (there is no disjunction). The greater the difference of orientation between these two segments, the stronger is the tension of the spine (or the disjunction). Torsions of the trunk are frequently used in yoga[lx] and in gymnastics[lxi], to lengthen the spine and muscles attached to thorax and pelvis. For de Sambucy, such torsions have little influence on respiration, but mobilize back muscles. In acupuncture physiotherapy, disjunction exercises are used to influence liver and kidney meridians (personal notes taken from courses given by Hiroshi Nagasaki). Thus, one can see disjunction between segments in two different ways: a) as a way of coordinating different aspects of a situation, and b) as a way of influencing inner physiological phenomena.

4.3.2. The function of connecting posture

A base posture on which no connecting posture is built is a posture where the weight of the upper part of the body is transmitted to base by the spine and back muscles. In such postures, all respiratory responses are possible and no part of the body develops tensions and habits that could harm physiological functions. Ideal postures, from the biomechanical point of view, are always postures with a minimum of auto-contact, especially in the upper half of the body. Postures such as the one adopted by Rodin's *The Thinker* are exactly those that experts in biomechanics do not recommend. The curved spine pushes the thorax inwards, thus restricting thoracic breathing (Cantin, 1989). The pressure of the lower trunk against thighs inhibits abdominal breathing. Only breathing of the middle abdomen is comfortable. There is little mobilization of back muscles and, if the *The Thinker* were attacked, he would need a lot of movements before he could take a stance useful for defense, attack or flight. Most postures with an important connecting posture can be analyzed in a similar way, which is to say negatively from a biomechanical point of view. Leg crossing when sitting, for example, is a position that restricts venous circulation and might favor the apparition of varicose veins[lxii]. Another way of considering this postural domain is to state that connecting posture reduces physiological activity, which may be useful in other situations, and focuses physiological arousal management around relevant goals for this situation. What is therefore diminished is the ease to adapt oneself to other frames of mind if it is suddenly required. The posture of Rodin's *The Thinker* inhibits venous circulation in the legs and prevents complete breathing; but thinking requires a sympathetic internalization of the blood flow anyway, and the posture does convey that one is not expecting to be disturbed. Thus, while base posture seems to regulate the fundamental relation between an organism and a situation, connecting posture seems to be centered more around auto-regulative functions, relating basic situational relation to physiology and inner atmospheres.

Before the 1970's in Europe and North America, a 'heavy' (e.g., involving many parts of the body) connecting posture was also a sign of 'bad' manners. During meals, hardly any parts of the body must rest on the table. It was also considered bad manners to touch one's face while talking to somebody, to cross one's legs, to cross one's arms, etc. Nevertheless, all these positions were frequently used, even then.

In most psychotherapeutic groups I have attended, a person that has a 'heavy' connecting posture is described as 'closed', and/or as resisting contact with the group, the therapist. A closed posture is analyzed as repressing breathing and, therefore, as diminishing libidinal charge which anchors a person in a non-responsive attitude towards therapy. There is a deeply rooted mythology in the psychotherapeutic world, which automatically associates a heavy connecting posture with schizophrenic withdrawal. Efforts are explicitly made by the group leader and members to 'open up' (implying less connecting posture) a 'closed' person. Many examples can be found on the Internet of professionals who claim to "know" that there is a strong link between the following psychological and postural variables:

- *Openness*: Open hands, unbuttoned coat.
- *Defensiveness*: Arms crossed, sideways glance, touching-rubbing nose, rubbing eyes, buttoned coat, drawing away.[lxiii]

In one of the rare studies of this variable that I am aware of, made by Mehrabian, the results were less clear:

> The findings from all three of the decoding experiments suggest that greater relaxation, a forward lean of the trunk towards one's addressee, and a smaller distance to the addressee communicate a more positive attitude to the addressee than a backward lean of posture and a larger distance. *The findings do not provide much support for the hypotheses which relate more open postures and more direct orientation to more positive attitude inferred by an addressee*[17]. The later two variables, that is, openness and orientation, however do interact with several of the other variables included in the experiments in determining inferred attitudes. (Mehrabian, 1968)

As far as I know, Mehrabian's formulation remains the closest to what is known. Crossed arms may be indicative of "defensiveness" only if other body parts support this possible meaning. The context is crucial in this case. It is therefore incorrect and unethical to professionally attribute defensiveness to a person because he or she has crossed arms.

As in all classifications, there are cases of fine motor communicative gestures which use auto-contact. These are mostly surface of posture events. Codified insult and threat signals, shown in Morris[lxiv], are of this nature: for instance, the gesture where one mimics a blade cutting a throat with two fingers to say "I'll cut your throat!" Examples of codified gestures using auto-contact can also be found[lxv] in deaf-and-dumb sign language. Functionally, these movements really belong to surface of posture.

4.4. Surface of posture

Surface of posture is represented by a number of parts of the body which do not touch the floor, a chair or another part of the body, and which are not coded as beams. This variable informs on how many parts of the body, and which ones, have been freed by a postural option from base and connecting posture functions, so as to become available for more interactive aspects of behavior such as tool handling, signaling, social gestures, speaking, etc. Touching an object (a handbag, the microphone) or waving one's hand in mid-air, are examples of such activities; so are facial expressions and vocalizations. As these are the better-known aspects of nonverbal communication for which coding procedures exist[lxvi], and as my main interest is in the relation between postural levels, I have coded when a part of the body is in surface of posture, but I have not analyzed what these parts of the body did when in surface of posture.

4.5. Intermediary structures

Two types of positions are still to be considered. A first set of positions overlaps directly on several postural systems: when a hand slips between a thigh and the seat, for example, it belongs to basic and connecting postures simultaneously. There are also more subtle cases: right hand touches right thigh (and therefore belongs to auto-contact surface), right elbow touches back of the chair (and therefore belongs to basic surface)... where should one place the right forearm? In this example, given the approach used here, the forearm must be regarded as a beam set between basic and connecting levels. I thus had to define intermediary structures, consisting exclusively of beams: intermediary Structure 1 includes parts of the body set between basic and connecting postures. Intermediary Structure 2 includes parts of the body set between connecting posture and surface of posture. Intermediary Structure 3 includes parts of the body set

[17] My italics.

between base posture and surface of posture without bypassing connecting system.

4.6. Discussion

The Postural Dynamic Code is a summary of basic biomechanical notions that can be evaluated with the eye, which are relevant for the analysis of social behavior, as in my 1991 study on social status, and can be aspects of postural behavior that could be relevant to studies of social behavior. Furthermore, I have attempted to show that some aspects of postural behavior currently coded in studies of nonverbal behavior could be more clearly defined if bodily behavior were approached as a global phenomenon.

4.6.1. A postural approach of status behavior

The Postural Dynamic code can coordinate in an easily analyzable way the various items used to study the postural dimensions of social behavior discussed by Ervin Goffman and Adam Kendon[lxvii]. One of the hypotheses at the root of Postural Dynamics, as applied to social behavior, is that the power of a situational variable can be measured by i) postural weight, and ii) by how many postural dimensions are influenced. Postural weight depends on the number of body parts involved in structuring a posture, and of their involvement in weight distribution. Rodin's *The Thinker* uses a certain number of body parts in base posture (the heaviest postural dimension), a considerable number of body parts in connecting posture (medium postural weight), and no parts of the body in surface of posture (no postural weight). The postural weight code distinguishes 14 ways of participating in postural dynamics, ranging from 1 for base posture, to 9 for auto-contact, and up to 14 for surface of posture. By averaging the coded values, one can compute a global average postural weight. This variable was unfortunately discovered at the end of the study on social status, so that I have regrettably used numbers that are the opposite of the notion of weight: the largest possible value indicates lightness. This should be changed in the future. Rodin's *The Thinker* would have a global mean postural weight that would compute to a value between 1 and 9 (e.g., 4.5), while a person floating in space would have an average of 14 if there were no auto-contact.

Postural weight is a useful way to describe restaurant rituals. A customer's anchoring point is usually more or less oriented towards the table, especially when he is eating. Waiters typically walk between tables and a door situated near the kitchens. Customers only walk for a set of known reasons: when they enter or leave; when they go to the toilet or talk on their cell phone. Sitting at the same table as somebody else is a basic statement, equivalent to "I want to spend time with you." What is exchanged during a meal is often secondary. Surface of posture regulates the interaction in such a way that time passes appropriately. Content is seldom primordial. The ending situation may be announced through surface of posture exchanges (like fixing a date for a next meeting), but it is only actualized through a fundamental base posture change, which occurs when customers stand up, orient themselves towards the door and step out in the street.

Postural weight can also be used to evaluate the quality of a restaurant's service. When service is ideal, waiters guess all the client's wishes before he even needs to signal. If all you need to do is say a word or make a small sign with a finger to catch a waiter's attention, service is still of a very high standard. When the same task requires that you interrupt a discussion and even mobilize connecting posture, then service becomes what it often is: standard. If you even have to involve your base posture (e.g., having to walk to the waiter to ask for

the menu after having waited 20 minutes), one is entitled to think that from the point of view of service this restaurant is a bad one. A restaurant where there are no waiters and where customers sit to eat and stand to serve themselves has a special name: a self-service.

In a restaurant, two situations compete:

- Situation a: the relation between customer and waiters.
- Situation b: the relation between customers seated around a table.

When the service is impeccable, customers can relate with each other without worrying about the service; all three postural levels can constantly regulate the interaction with the other customers. If the service is bad, even base regulations are interrupted. In some restaurants, like a Parisian “brasserie”, the service is relatively good, but its intrusions are part of the fun.

Postural weight differentiates nicely the various social roles which characterize restaurant rituals, but it does not differentiate as explicitly social class differences within each role. The reason: role is associated with base posture options, not socio-economic status. In a cinema, which is even less class selective than a restaurant and where the situation is even less focused on putting status in evidence, one could wonder if socio-economic status influences bodily behavior. If one follows the basic hypothesis of Postural Dynamics, a way of knowing how strong a status influence is in a given situation would be the following:

- If status does not influence behavior, no correlation between status and behavior can be observed.
- If status influence is weak, it will only influence surface of posture.
- If status influence is very strong, it will influence base posture as well as all other postural levels.

4.6.2. Using Postural Dynamics in video analysis therapy

Some psychotherapists use video analysis as a psychotherapeutic intervention. My knowledge in this area comes from George Downing’s *Video Micro Analysis Therapy* (VMT) method. In his seminars I have repeatedly observed that once one has an evaluation of long-term goals by considering the global posture used, one can often predict what issues will impose themselves on interpersonal dynamics a few minutes in advance. Here is an example observed in a course given by Downing and myself in Greifensee, near Zurich, November 11, 2004.

> The therapist has a film of a mother and her three children, two of which are hyperactive. Two stances can be observed at the beginning of the session:
>
> - The therapist sits on a stool; his feet are flat on the floor and the spine is straight. This typical active posture aims at supporting focused support surface activities. In this case, the therapist wants to discuss the film of the mother and her three children. He wants to select some samples of the film he has analyzed, and show interesting details on how the family regulates by viewing slow motion samples. He is happy about what he is going to show, as he announced that the mother has improved her way of setting boundaries to the hyperactive children. In this posture auto-contact is quasi-nonexistent, and the spine transfers the weight of the head and shoulders to the pelvis. Exposure of basic posture to gravity is thus maximum.
> - The mother's strategy is closer to that of *The Thinker’s*. Legs are crossed, the spine forms a "C", one arm is on the belly and chest, the other has the elbow placed on the back of the chair (le dossier) and holds the head with the hand. Gradually she strengthens the dominance of auto-contact by covering the face with her hand. My intuition is that she would like to regress into full auto-

> regulation, and to be taken care of by the therapist. The problem is that her children are playing in the next room with no one to watch over them. The strengthening of the auto-contact structure began when the younger child began to cry and to call her mother. Quite obviously, the mother is exhausted by her children and would need some care taking. Her husband left home two years ago.[18]

As I began to view this vignette, I immediately pointed out that therapist and patients had two very different postural global configurations, which could be associated to two different ideas of what that meeting was about, and of what was expected. This vision was confirmed when the younger 3 year-old child suddenly barged into the room screaming and crying, displaying the whole range of a temper tantrum. The therapist wants to teach the mother to set limits, and still wants to show his film. He orients his pelvis towards the video, and at first the mother does the same, hoping the child gets the message. While both pelvises are being oriented towards the TV screen, the heads are oriented towards the child. This is a typical sign that the main goal of the situation is the video therapy session. But the child does not care, his tantrum intensifies. The mother must now unfold her connecting posture, stand up and try to soothe the child. His temper tantrum becomes even more intense. The mother tries to calm the child, but finally she leaves the room with the child. During this mother-child interaction, the therapist remains oriented towards the screen with all his body oriented towards the screen, except for the head that is turned to follow the mother-child interaction. In this example, the child has clearly disrupted a manifest expectation, and required that the mother involve herself, using her whole posture, with him and not with the therapist.

As the mother goes out, the therapist remains seated, pelvis oriented in the direction of the television. When the mother enters the room again the therapist remains seated, but briefly orients all the segments of the body towards the patient, and when she sits down orients himself towards the television screen. The patient sits as she was before. Pelvis is oriented towards the therapist, legs and arms are crossed, jaw is tense, and the furrow around the nose is deepened for a few minutes. The therapist becomes more and more enthusiastic about what can be seen on the video recording of how the mother managed to set limits to her children in the filmed situation. The mother orients her head towards the film. The child enters the room. Both therapist and mother orient their head towards the child but do not change their basic and connecting postures. The child gets the message, is called by his sister, and goes out of the room again. The mother does not unfold, she needs to accept that this is a video analysis session not a therapy session focused on her here-and-now feelings. The base posture alliance between the therapist and the patient has resisted the assaults of the young child. The mother only relaxes slightly, but enough to become interested in what the therapist wants her to understand. Her face and hands become involved in the discussion (they enter surface of posture) while the rest of the body remains in basic and connecting posture.

When a situation is viewed from this angle, what is stressed is often different from what an analysis of facial behavior would highlight, or a classical family therapy analysis would reveal. Again, I am not suggesting that the other points of view are not relevant, but I am affirming that those dimensions of the video

[18] The observation was reported Marcel Raas, who is a child and adult psychiatrist in Switzerland. He kindly permitted me to describe this case.

therapy session I have described are highly relevant and can easily be accessed by following the principles of Postural Dynamics.

5. Postural Dynamics and social status

To understand the social dimensions of postural dynamics, I studied interactions in association with institutional status in two different situations:

- University situation: Six first-year university students each interviewed another first-year student, and an assistant of their faculty.
- Nurse school situation: Nine first-year nurse school students interviewed a first-year nurse school student and a teacher of that school.

All are female. The design permitted me to study 60 dyads and 45 participants. The topic of discussion in these semi-structured interviews was: Do you think social status influences bodily behavior? These discussions lasted approximately seven minutes. One video camera recorded a profile of the protagonists, and two cameras filmed the front of each body. The postural code was designed with the help of Siegfried Frey's team in the Faculty of Psychology of Bern University, and then in Duisburg University where I presented the study in a doctoral thesis. The code was designed so that it could use the methods of analysis employed by Siegfried Frey's team.

5.1. Analyzing base surface

5.1.1. Base posture coding

Base posture is described as the list of parts of the body touching chair or floor at a given moment. *Average base surface* is the average number of parts of the body touching chair or floor in a situation. For base posture I coded the following 26 parts of the body: right and left hands, wrists, arms, elbows, upper arms, shoulders, upper back, lower back, flanks, bottom, upper legs, lower legs, feet. For each part of the body I used a two-dimension code: 0 (no touch), 1 (touch).

A base posture configuration is then described by a number such as this:

01001100110011001100110011

The two first numbers are right and left hands, and the two last numbers are right and left feet. I checked the position of every part of the body every half of a second. People do not move so much in base posture. I was therefore able to code the complete interactions of the university study in six months. Behavior was standard for such situations, which means probably less varied than in many others.

The width of repertoire was established by counting the different combinations of "0" and "1" that were observed. In the 12 university dyads, 104 different base posture configurations were observed; 261 base posture configurations were observed in the 18 nurse school participants' dyads; and 346 in all dyads. Only 19 configurations were observed at least once in each institution. The diversity may be partially due to the method, but it is certainly much bigger than what could be expected from the literature. Every subject brought her own set of configurations and dynamics. These had common aspects. For example, in nearly all cases bottom touched seat. Nevertheless, these relatively formal ways of sitting had their individual touch. A less crude code would have yielded a much greater number of configurations. For example, I could have distinguished hand touching seat from

hand touching back of chair, or fingers touching seat from palm touching seat, etc.

Without going into refined procedures, I shall now compute the *information grid* that a base posture code manages, accepting that static parts of the body carry as much information as mobile ones:

> I analyzed 12,430 seconds of behavior. The number of information bits contained in the coded data is at least (24,860 half a second) * (26 parts of the body) * (2 coding dimensions for each part of the body) = 1,292,720 information bits (an average of 43,090.67 information bits per dyad). This is the amount of information my programs dealt with each time they had to compute such variables as the number of postural movements that occurred, or the mean number of parts of the body supported by chair and floor. This computation excludes more qualitative information on base posture I have also coded, such as the way the pelvis is anchored on the chair. Most of the distinctions made by this grid became relevant at various moments of this study.

5.1.2. Global postural coding

To study global posture I focused on the nurse school films. Coding was still kept as simple as possible. I needed to code more parts of the body for this coding (head, belly, knees, etc.), amounting to 47 items. The 36 nurse school samples yielded 984 configurations of auto-contact, and 1501 different global postural configurations. Again, using a more sensitive code would have yielded a larger numbers of combinations.

Although simple, this code used 13 dimensions per part of the body: a part of the body could touch the chair, or could be in auto-contact, or could touch nothing, or could touch the chair and a leg, etc.: 13 dimensions of 47 parts of the body during 10,688 half-seconds were analyzed. Computing as before, we now have a grid of 6,530,368 possible information bits on 27 participants, and of 362,798.2 information bits for a dyad lasting 297 seconds on average.

As I was coding, I was struck by the variety of individual behaviors even in such a standardized situation. Few configurations were used by more than half of the participants, most were used by only one of them. What one really has here is data on individual bodily imagination. I don't know how many people I should film in such a situation to observe a certain stabilization of the repertoire. These results show at least two things:

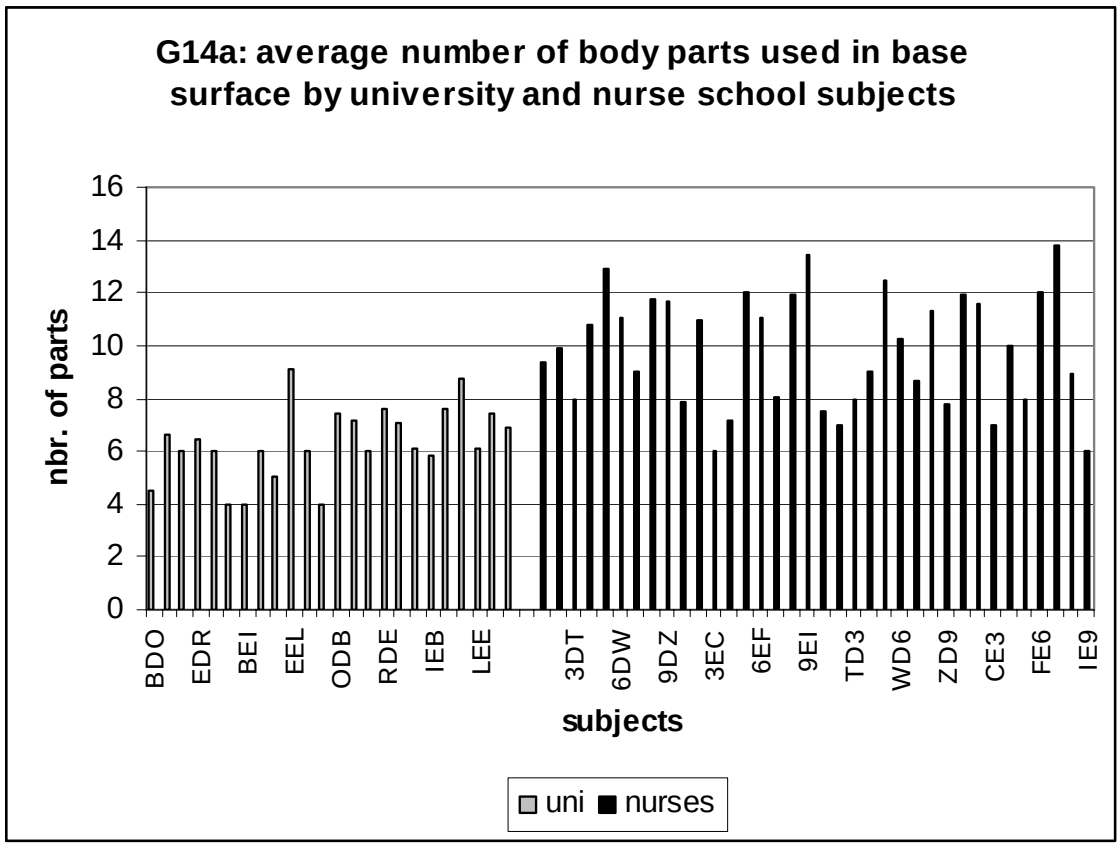
> a) The tremendous amount of information involved in current interactions.
> b) The relevance of repertoire for a group. Clearly nurses had a different repertoire than university participants, each subgroup had a different repertoire, and nearly every individual used postures no other individuals in the experiment used.

If each individual uses a different repertoire from all others, then, of course, the repertoire of each group would also be different. Nevertheless, the data suggests that one could talk of a group repertoire, as it seemed that the behavior of members of a group have common denominators.

5.2. Specific variables or signals & global variables

Nurses had a tendency to sit more backwards than university participants, and to have more parts of the body touching chair or floor (Graph G14a[19]).

[19] The numbers of the graphs correspond to the numbers in Heller, 1991.



Uni: University Subjects		Nurses: Nurse School Subjects
N:	24	36
Mean:	6.31	9.837
S.D.:	1.375	2.161
Unpaired t-test:	-7.07, 58, 0.000	

Graph G14a shows the average number of body parts touching floor and/or chair of all observed cases. Most nurse participants used a bigger support surface than university subjects.

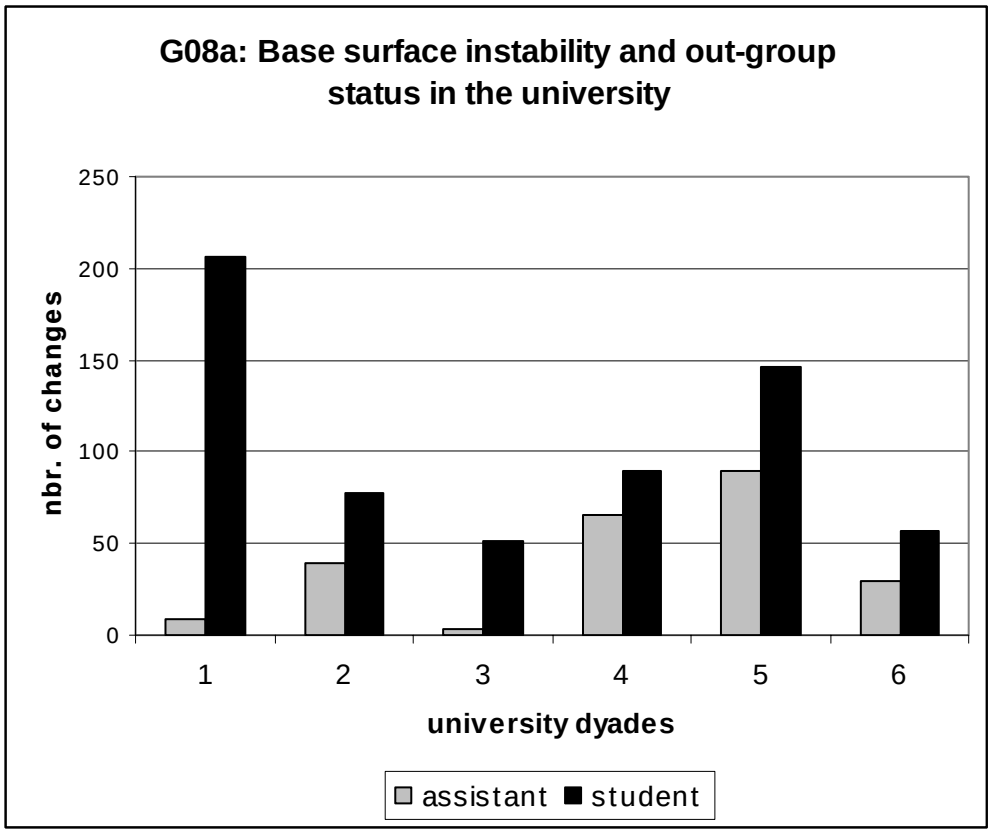
To sit more backwards can be perceived as a 'signal'. But the measure of number of parts touching the chair is a more complex variable, half-way between the notion of signal and that of repertoire. Indeed it is not specified in this variable which parts of the body are involved. In some cases, the width was caused by the back leaning against the back of the chair (20 nurse school subjects); in other cases because more parts of the legs were touching the lower part of the chair (this possibility was never used by university subjects); in still other cases, because more parts of the arms touched the chair; and in others, yet, because a mixture was used.

5.3. In-group & out-group status

Three variables related to status are considered here :

- *Institution* (nurse school/university)
- Out-group status or *status* (university assistant/student subjects, nurse school teacher/pupil subjects).
- In-group status or *role* (experimenter/subject)

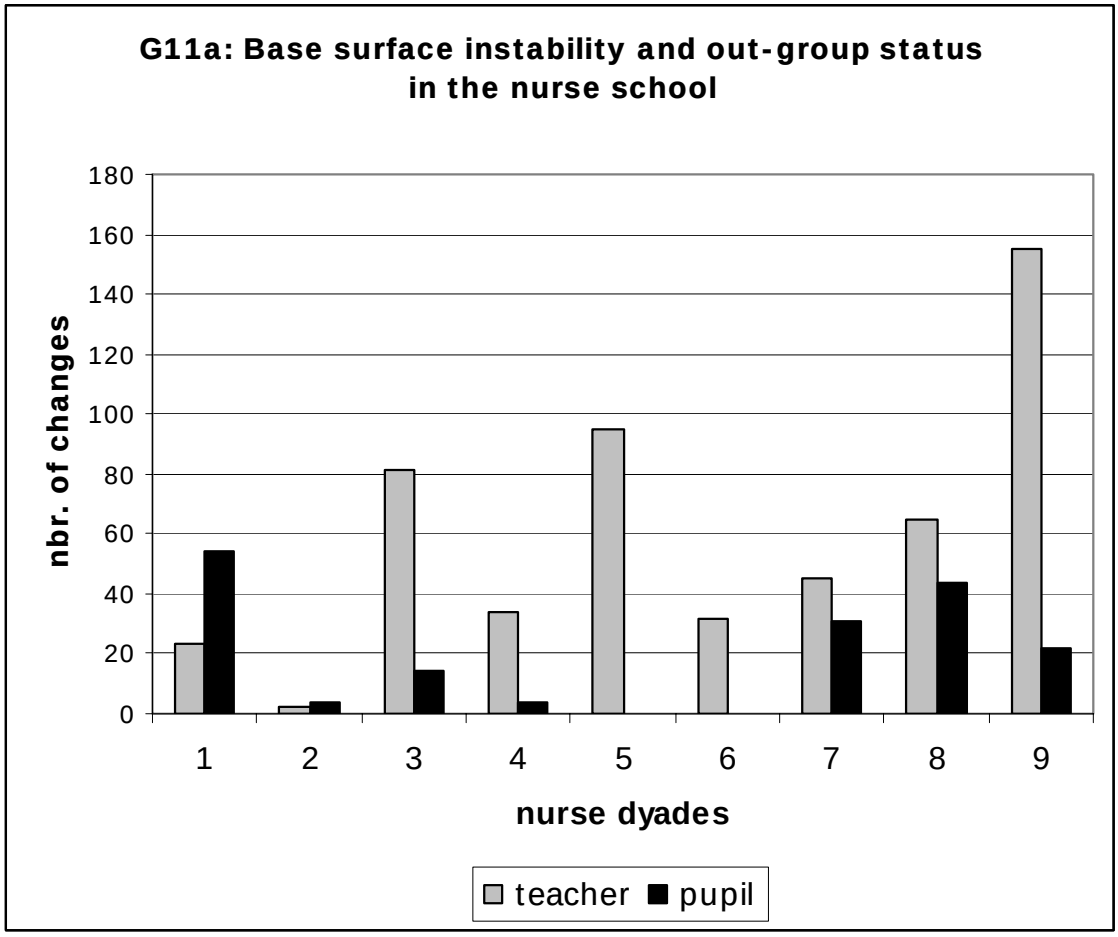
5.3.1. Base surface instability



	University assistant subjects	University student subjects
N:	6	6
Mean:	39.333	104.500
S.D.:	33.327	60.182

Unpaired t-test: t = -2.32, d.f. = 10, p. = 0.043
Paired t-test: t = -2.43, d.f. = 5, p. = 0.059
Correlation: .105

G08a shows the number of changes of base surface made by assistants and student subjects in the University. The subjects are paired in function of their common student interviewer. In all dyads, students display base surface changes more than the paired assistant does.



Nurse School Teacher Subjects		Nurse School Pupil Subjects
N:	9	9
Mean:	59.111	19.222
S.D.:	46.269	19.999

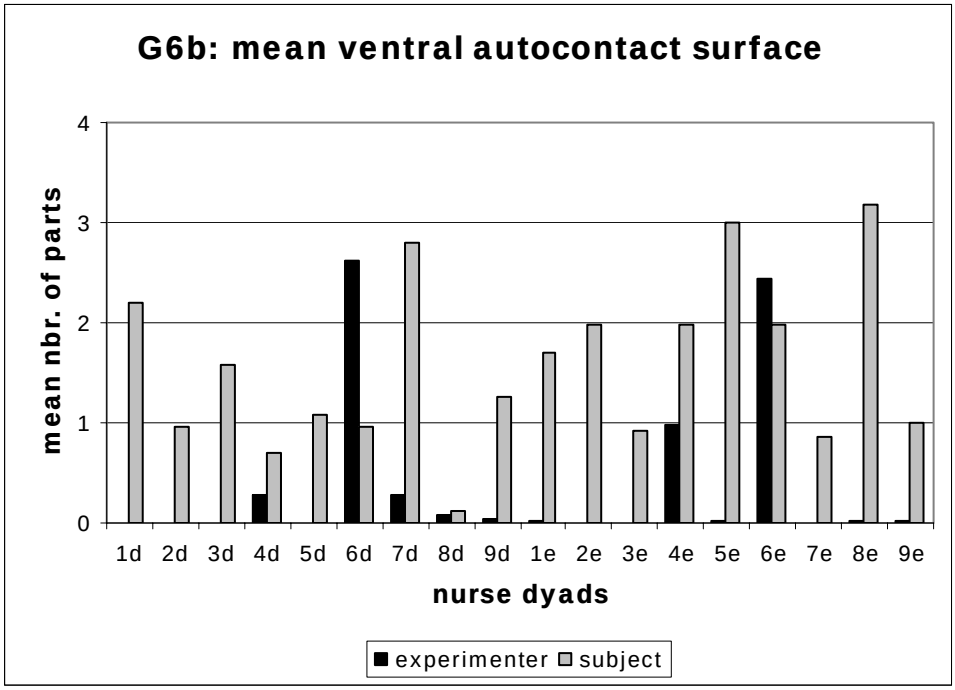
Unpaired t-test: t = 2.374, d.f. = 16, p. = 0.030
Paired t-test: t = 2.369, d.f. = 8, p. = 0.045
Correlation: -.006

G11a shows the number of changes of base surface made by teacher and pupil subjects in the nurse school. The subjects are paired in function of their common pupil interviewer. In the first two dyads, the pupils behave like interviewed university students, as they changed their base surface more often than the paired teacher. In the nine other dyads, the difference is that pupils clearly had a lower base surface mobility than the paired teachers.

Out-group status was mostly related to global variables, while role was mostly related to specific variables. Graph 11a shows a difference between teacher and pupils in the nurse school: in 7 out of 9 dyads, the teacher had more base surface changes than the student interviewed by the same experimenter. This difference is not due to cultural patterns, as in the university group this variable is also relevant, but has the opposite effect, as shown in Graph 8a: here, the students changed base posture more often than assistants. These results are also independent from the participant's opinion on the relation between status and bodily behavior.

An instructive aspect of this data is that results have been inversed. That may be because the status difference is stronger in the nurse school, and/or because that type of variable is highly context relevant.

5.3.2. Base surface instability



Nurse School Teacher Subjects		Nurse School Pupil Subjects
N:	18	18
Mean:	0.378	01.571
S.D.:	0.816	0.851
Unpaired t-test:	t = -4.295, d.f. = 34, p. = 0.000	
Paired t-test:	t = -4.269, d.f. = 17, p. = 0. .001	
Correlation:	-.012	

Ventral auto-contact surface informs us on how many parts of the body situated between neck and groin are being touched by another part of the body (mainly arms, hands and thighs). Graph G6b shows the average ventral auto-contact surface used by nurse experimenters and subjects. The numbers under the horizontal axis indicate the interviewers (always pupils), "d" stands for different status dyads (with teachers) and "e" for equal status dyads. Experimenters had a tendency to use small (mostly nonexistent) average ventral auto-contact surfaces, while most subjects used larger ones.
G11a shows the number of changes of base surface made by teacher and pupil subjects.

'Soft' parts at the front of the body (from throat to sex) are discussed in the literature as relevant with phylogenetically inherited dominance behavior[20]: only the strongest can dare to leave them exposed. In this experiment, exposure of the parts is measured by the average ventral auto-contact surface (how many parts of this area are touched) by another part of the body (mostly hands and arms, or crossed legs for the lower abdomen and sex). Mehrabian (1968, 1969, 1981) and Henley (1977) among others, qualifies postures with exposed ventral surface as 'open' and postures with protected ventral surfaces as 'closed'. In the nurse school, all participants used fairly opened postures; nevertheless, as

[20]. Morris, 1978, pp. 136-138, 133-135.

shown on Graph G6b, nurse subjects more often than nurse experimenters touched ventral surface. This variable is usually classed among standard nonverbal signals.

Each group could be related to several bodily phenomena in a similar way, situated at all three postural behaviors. It is nevertheless of interest to note that most relevant specific signals were related to role rather than out-group status, because most findings on social status and bodily signals have focused on in-group status. For example, it is in studies on dominance in schools that Weisfeld & Beresford (1982) found a correlation between erectness and dominance. Being dominant with classmates is clearly very different from being dominant from the point of view of economical status. This issue nevertheless requires more research and more thinking as the distinction is not absolute.

These examples taken from my study on posture and social status show how a body is simultaneously influenced in a differentiated way by different causal factors, the implication being that congruent behavior is probably seldom the best mode of adaptation. Bodily behavior seems to be sensitive to nearly any variable one can think of. This multiplicity begs for complex ways of dealing with bodily behavior, such as those proposed by Levi-Strauss. I do not think that purely individual attempts to deal with such a complexity could ever be efficient, even when using such 'preset packages' as those described by the more 'Darwinian' schools (Heller, 1992b, c).

5.4. Conclusion

There is a tendency to surmise that innate behaviors have their strongest impact on facial behavior, while culture would have a stronger impact on posture. Most of the data accumulated by human ethology would not support such a statement on posture, and I have also observed repertoire phenomena on the face[lxviii]. I really do think that nature and cultural mechanisms interact at all layers of our bodily life. I never forgot a question read in Marx 20 years ago: “If society is not a natural phenomenon, what is it?”

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Annex I : Postural dynamics codes used for this study

General principle: each line is a moment, each column is a body dimension, and at each relevant intersection there is a code.

6.1. Code used for the university experiment

Col.	Part of the body	Dimension	Position	code
12	Bottom	Rotational turn	90 degrees away	6
		strongly away		4
		slightly away		2
		straight forward		1
		slightly toward		3
		clearly toward		5
		90 degrees toward		7
13	Chest	Rotational turn	90 degrees away	6
		strongly away		4
		slightly away		2
		straight forward		1
		slightly toward		3
		clearly toward		5
		90 degrees toward		7
14-16	Trunk	Sagittal Angle	flat backwards	180^o
		pright (MH: is this correct?)		90^o
		lat forward		0^o
17-19	High Upper Leg	Vertical Angle	high up	$+90^o$
		Horizontal		0^o
		way downward		-90^o
20-22	Pelvic Angle	open angle		180^o
		half open angle		90^o
		closed angle		0^o
23	Right Hand	Touch contact chair/floor		1
		no contact chair/floor		2
24	Left Hand	Touch contact chair/floor		1
		no contact chair/floor		2
25	Right Wrist	Touch contact chair/floor		1
		no contact chair/floor		2
26	Left Wrist	Touch contact chair/floor		1
		no contact chair/floor		2
27	Right Lower Arm	Touch contact chair/floor		1
		no contact chair/floor		2
28	Left Lower Arm	Touch contact chair/floor		1
		no contact chair/floor		2
29	Right Elbow	Touch contact chair/floor		1
		no contact chair/floor		2
30	Left Elbow	Touch contact chair/floor		1
		no contact chair/floor		2
31	Right Upper Arm	Touch contact chair/floor		1
		no contact chair/floor		2
32	Left Upper Arm	Touch contact chair/floor		1
		no contact chair/floor		2
33	Right Shoulder	Touch contact chair/floor		1
		no contact chair/floor		2
34	Left Shoulder	Touch contact chair/floor		1
		no contact chair/floor		2
35	Right Back	Touch contact chair/floor		1
		no contact chair/floor		2
36	Left Back	Touch contact chair/floor		1
		no contact chair/floor		2
37	Trunk, right side	Touch contact chair/floor		1

		no contact chair/floor		2
Col.	Part of the body	Dimension	Position	code
38	Trunk, left side	Touch	contact chair/floor	1
		no contact chair/floor		2
39	Right Lower Back	Touch	contact chair/floor	1
		no contact chair/floor		2
40	Left Lower Back	Touch	contact chair/floor	1
		no contact chair/floor		2
41	Right Bottom	Touch	contact chair/floor	1
		no contact chair/floor		2
42	Left Bottom	Touch	contact chair/floor	1
		no contact chair/floor		2
43	Right Upper leg	Touch	contact chair/floor	1
		no contact chair/floor		2
44	Left Upper leg	Touch	contact chair/floor	1
		no contact chair/floor		2
45	Right Lower leg	Touch	contact chair/floor	1
		no contact chair/floor		2
46	Left Lower leg	Touch	contact chair/floor	1
		no contact chair/floor		2
47	Right Foot	Touch	contact chair/floor	1
		no contact chair/floor		2
48	Left Foot	Touch	contact chair/floor	1
		no contact chair/floor		2
73	Bottom - Mode of Anchoring:			
		Sagittal tilt on ischia bones		1
		on ischia bones & on coccyx		2
		on coccyx		3
		on coccyx & sacrum		4
		on sacrum		5
74	Bottom - Depth of anchoring on the seat:			
		front		3
		middle		1
		back		2
75	Bottom - Width anchoring on the seat:			
		left (towards other)		3
		middle		1
		right (away)		2

6.2. Code added for the nurse school experiment

Col.	Part of the body	Dimension	Position	code
12	Bottom	Rotational turn: 90 ^{o} degrees away		6
		strongly away		4
		slightly away		2
		straight forward		1
		slightly toward		3
		clearly toward		5
		: 90 ^{o} degrees toward		7
13	Chest	Rotational turn:90 ^{o} degrees away		6
		strongly away		4
		slightly away		2
		straight forward		1
		slightly toward		3
		clearly toward		5
		: 90 ^{o} degrees toward		7
23	Right Hand	Touch	postural weight	1 to 15
24	Left Hand	Touch	postural weight	1 to 15
25	Right Wrist	Touch	postural weight	1 to 15

26	Left Wrist	Touch	postural weight	1 to 15
Col.	Part of the body	Dimension	Position	code
27	Right Lower Arm	Touch	postural weight	1 to 15
28	Left Lower Arm	Touch	postural weight	1 to 15
29	Right Elbow	Touch	postural weight	1 to 15
30	Left Elbow	Touch	postural weight	1 to 15
31	Right Upper Arm	Touch	postural weight	1 to 15
32	Left Upper Arm	Touch	postural weight	1 to 15
33	Right Shoulder	Touch	postural weight	1 to 15
34	Left Shoulder	Touch	postural weight	1 to 15
35	Right Back	Touch	postural weight	1 to 15
36	Left Back	Touch	postural weight	1 to 15
37	Trunk, right side	Touch	postural weight	1 to 15
38	Trunk, left side	Touch	postural weight	1 to 15
39	Right Lower Back	Touch	postural weight	1 to 15
40	Left Lower Back	Touch	postural weight	1 to 15
41	Right Bottom	Touch	postural weight	1 to 15
42	Left Bottom	Touch	postural weight	1 to 15
43	Right Upper leg	Touch	postural weight	1 to 15
44	Left Upper leg	Touch	postural weight	1 to 15
45	Right Lower leg	Touch	postural weight	1 to 15
46	Left Lower leg	Touch	postural weight	1 to 15
47	Right Foot	Touch	postural weight	1 to 15
48	Left Foot	Touch	postural weight	1 to 15
52	Right Head	Touch	postural weight	1 to 15
53	Left Head	Touch	postural weight	1 to 15
54	Right Face	Touch	postural weight	1 to 15
55	Left Face	Touch	postural weight	1 to 15
56	Right Neck	Touch	postural weight	1 to 15
57	Left Neck	Touch	postural weight	1 to 15
58	Right Throat	Touch	postural weight	1 to 15
59	Left Throat	Touch	postural weight	1 to 15
60	Right Thorax	Touch	postural weight	1 to 15
61	Left Thorax	Touch	postural weight	1 to 15
62	Right Belly	Touch	postural weight	1 to 15
63	Left Belly	Touch	postural weight	1 to 15
64	Right Groin	Touch	postural weight	1 to 15
65	Middle Groin()	Touch	postural weight	1 to 15
66	Left Groin	Touch	postural weight	1 to 15
67	Right Pelvis	Touch	postural weight	1 to 15
68	Left Pelvis	Touch	postural weight	1 to 15
69	Right Knee	Touch	postural weight	1 to 15
70	Left Knee	Touch	postural weight	1 to 15
71	Right Ankle	Touch	postural weight	1 to 15
72	Left Ankle	Touch	postural weight	1 to 15

Please contact me if you require more information.

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[i] Davis 1972, p. 2.
[ii] Davis, 1972, p. 2.
[iii] Bourdieu, 1977, p. 51.
[iv] Frey *et al*. 1983, p. 143.
[v] Davis, 1975, p. 7.
[vi] Birdwhistell, 1970, p. 76.
[vii] Frey *et al*., 1980.
[viii] Wilhelm, 1984, pp. 122-125.
[ix] Hall, 1966, 1969.
[x] Bateson, 1971, p. 23.
[xi] Efron, 1972.
[xii] Birdwhistell, 1970, p. 203.

[xiii] Cosnier & Brossard 1984, p. 5.
[xiv] Birdwhistell, 1970, pp. 261-262.
[xv] Birdwhistell, 1970, pp. 257-302.
[xvi] Rolf, 1977. p. 285.
[xvii] Rolf, 1977, p. 289.
[xviii] De Sambucy *et al*, 1973, p. 404.
[xix] Feldenkrais, 1981, p. 1.
[xx] Feldenkrais, 1981, p. 1.
[xxi] Michaël, 1985.
[xxii] Chuang Tzu, 1971, p. 78.
[xxiii] Perez-Christiaens, 1983.
[xxiv] Jones, 1979, p. 2.
[xxv] Rolf, 1977, pp. 288-289.
[xxvi] Birdwhistell 1970, p. 205.
[xxvii] Leroi-Gourhan, 1964, pp. 25–60.
[xxviii] Leroi-Gourhan, 1965.
[xxix] Frey, 2001, p. 263.
[xxx] Scheflen1972, p. 27.
[xxxi] Kendon & Ferber 1973, pp. 613-616.

[xxxii]. Gangloff, Chan Tak Nam & Lepoutre, 1984; Kozier & Erb, 1985, pp. 565-566; Draganova, Tsvetkov, Gancheva, Armianov, Radneva, 1988; Nordmark & Rohweder, 1984, p. 198.
[xxxiii]. Bassi, 1967, pp.171-172; Davy, 1983; Kluken, 1983; Kozier & Erb, 1985, chapter 22; Guyton, 1984, p. 325; Bonnet & Millet, 1971, pp. 252-253.

[xxxiv] Sapir, 1927, p. 556.
[xxxv] Hewes 1955, 1957.
[xxxvi] Birdwhistell 1970, pp. 200 & 204.
[xxxvii] For exemple Exline, 1972, 1975.
[xxxviii] Frey & Pool, 1976.
[xxxix] Frey & Pool, 1976, p. 9.
[xl] Birdwhistell, 1970, p. 102.
[xli] Frey & Pool, 1976, p. 14.
[xlii] Frey & Pool, 1976, annex I.
[xliii] Frey, Jorns, Daw, 1980; Frey and all, 1983; Frey, 1984.
[xliv] Birdwhistell 1970, p. 44.
[xlv] Middendorf, 1980; de Sambucy, 1973, pp. 238-239; Perez-Christiaens, 1983, pp. 109-113.
[xlvi] Rolf, 1977, p. 87.
[xlvii] Hewes, 1955.
[xlviii] Kendall et al, 1979, pp. 233-235.
[xlix] Gesell 1934, pp. 769 & 777.
[l] Rolf, 1980, pp. 45-63; Lowen, 1975, pp. 95-96, 194-196.
[li] Page, 1978, pp. 35-44.
[lii] Rolf, 1977, pp. 70-80; Perez-Christiaens, 1983.
[liii] Weisfeld, G.E. & Beresford, J.M., 1982.
[liv] Frey, S. *et al* 1983, p. 150.
[lv] Wallon, 1954; Rochat et al, 1988.
[lvi] Rosenfeld, 1982, p. 265.
[lvii] Rochat, 2001, pp. 40-41.
[lviii] Morris 1978, pp. 136-138.
[lix] Morris 1978, pp. 133-135.
[lx] Iyengar, 1984, pp. 251-263.
[lxi] de Sambucy, 1973, pp. 253-254; Anderson, 1983, pp. 29-30.
[lxii] Brunner & Suddarth, 1985, p. 585.
[lxiii] James J. Messina, found on http://www.coping.org/communi/nonverbtr%20.ppt, 30.09.2004. Many examples of this hypothesis can be found on the Internet, though few are referenced.
[lxiv] Morris 1978, pp. 188-189 & 196.
[lxv] Morris, 1978, pp. 35 & 42.
[lxvi] For example Frey & Pool 1976; Ekman & Friesen 1978.
[lxvii] Argyle & Kendon, 1967, p. 67; Cosnier & Brossard, 1984, pp. 5-6; France, 1982, pp. 16-17; Goffman, 1979.

[lxviii] Heller, 1993; Lessko, Heller, Haynal, 1992.