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Intersubjectivity at Close Quarters: How Dancers of *Tango Argentino* Use Imagery for Interaction and Improvisation

The article explores the prerequisites of embodied 'conversations' in the improvisational pair dance *tango argentino*. Tango has been characterized as a dialog of two bodies. Using first- and second-person phenomenological methods, I investigate the skills that enable two dancers to move as a super-individual ensemble, to communicate without time lag, and to feel the partner's intention at every moment. How can two persons – walking in opposite directions and with partly different knowledge – remain in contact throughout, when every moment can be an invention? I analyze these feats through the lens of image schemas such as **BALANCE**, **FORCE**, **PATH**, and **UP-DOWN** (Johnson 1987). Technique-related discourse – with its use of didactic metaphor – abounds with image-schematic vectors, geometries, and construal operations like profiling. These enable the tango process: from posture, via walking technique and kinetics, to attention and contact skills. Dancers who organize their muscles efficiently – e.g., through core tension – and who respect postural 'grammar' – e.g., a good axis – enable embodied dialog by being receptive to their partners and being manoeuvrable. Super-individual imagery that defines 'good' states for a couple to stick to, along with relational attention management and kinetic calibration of joint walking, turns the dyad into a single action unit. My further objective is a micro-phenomenological analysis of joint improvisation. This requires a theory to explain dynamic sensing, the combining of repertory knowledge with this, and the managing of both in small increments. Dancers strategically sense action affordances (Gibson 1979) or recognize and exploit them on the fly. Dynamic routines allow them to negotiate workable configurations step-wise, assisted by their knowledge of *node points* where the elements of tango are most naturally connected and re-routed. The paper closes with general lessons to learn from these highly structured and embodied improvisational skills, especially regarding certain blind spots in current social cognition theory.

Keywords: cognitive ethnography, micro-phenomenology, co-regulation, improvisation, embodied apprenticeship, image schemas, metaphor, affordances

INTRODUCTION

My subject matter is *tango argentino,* an improvisational pair dance often noted for its complexity and rigor, but also for its elegance, expressive quality, and creative potential. Originating from the La Plata region of Argentina and Uruguay, tango has made its way to the metropolitan areas of the Northern Hemisphere, where it is a popular pastime, taught by a growing number of teachers. It is one of the most difficult dances to master, often taking years of practice before dancers enjoy full improvisational

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freedom. When people watch a proficient tango couple move across the dance floor – sometimes energetically, sometimes with small moves, but always with ease and harmony – most are left in wonder. Lay people possess at best a vague idea of how accomplished dancers move together or otherwise what comprises their knowledge 'in the flesh', which they earn through their dance floor 'mileage', hours of apprenticeship, and cultivation of general bodily sensitivity.

Among the many aspects of tango and the multiple abilities involved, I start from the seemingly elusive yet most gratifying skill of feeling like a super-individual unit: a condition of embodiment that has variously been described as *intercorporeality* (Merleau-Ponty 1945), *consubjectivity* (Csordas 1993), and a 'dyadic states of awareness' (Troninck 1998). For many *tangueros* and *tangueras*, this – before virtuosity or speed – is the prime hallmark of a satisfying dance. They speak in awe of the way that individuality dissolves into a meditative unity for the three minutes that the dance lasts. Time and space give way to a unique moment of presence, of ***flow*** within and between partners.[1] [2] I take this powerful experience of bodily intersubjectivity as my point of departure but will not examine it more closely. Rather, I wish to embrace cognitive-phenomenological methods to explore the skills that enable the experience and that, in turn, reflect the nature of tango as a *communication system*.

In particular, I am concerned with the following puzzling feats. How can two people – in different roles, walking in opposite directions, perceiving and knowing partly different things – turn into the proverbial ***four-legged beast***? What is more, how can this happen in a fully improvised action? To be sure, it takes two willing partners and a commitment to jointly interpret the music; but this is not enough. A good tango unfolds only when both partners do the right thing at the right time, together. How is seamless joint action possible in a pair dance that lacks choreography and eschews rigid scripts? The enjoyment of a well-connected improvisational dance seldom happens just by being open to it; exceptions testify to the rule. Good tango contact requires complex attentional and other cognitive skills that make the body receptive to the partner, guide active sensing, and create good dynamic form.

A cognitive approach is best suited to removing the almost numinous aura from improvisational skills, which non-practitioners tend to think of as unstructured intuition. Improvisation has remained an altogether neglected topic in dance studies for far too long.[3] Now that it is being discovered, scholars still mostly lack 'access to the inner workings of improvisation' (Drewal 2003: 119). Unfortunately, Sudnow's (1978) pioneering phenomenological study of jazz improvisation has not been followed up in other fields like dance. Worse, many dance scholars show little awareness of how improvisation relies on complex cognitive skills developed within – and calibrated to – social

[1] I will use bold italics for dancers' expressions as found in my empirical data.

[2] The expression ***flow*** is the one most frequently used by dancers. It may not be an accident that it resonates with Csikszentmihalyi's (1990) more scholarly notion, by which he describes moment-by-moment immersion in a gratifying task.

[3] In part, this reflects the long-time, rather unfortunate preoccupation with signifying practices – i.e., what 'a movement stands for or expresses' – instead of the intrinsic meaning of embodied performance (*cf*. Farrell and Varela 2008). Doing is what matters most to the practitioners of tango – and surely many other disciplines. This problematic limitation relates to the fact that scholars rarely practice what they write about.

interaction. Where the role of such cognitive structure *is* properly acknowledged (e.g., Hayes 2003; Manning 2009a,b), little exploration is made of the actual constraints on it. Dancer-scholars like DeSpain (2003) who develop innovative empirical methods for tracing dance experience remain the exception. In addition, approaches to dance improvisation should begin to draw on cognitively oriented methods that have been developed and tested in other fields (Minvielle-Moncla & Ripoll 2000, Maduell & Wing 2007, Mendonça & Wallace 2007, Magerko *et al*. 2009).

I will look at the prerequisites of improvisation through the lens of cognitive ethnography. My methodological route is to analyze the imagery that tango teachers use didactically and through which they and other dancers express their bodily skills. My inquiry enters, via language, into the felt gestalts of kinaesthesia, proprioception, touch, and other sensory experience. By analyzing the complex imagery involved – e.g., what tango dancers mean when they talk about ***being in axis*** or ***in contact*** – as well as the strategies of sensing and attention structuring, I hope to reconstruct the dance's most basic interaction principles. While some readers might simply be curious to learn the tricks of the tango trade, the topic makes an excellent test bed for theorizing about socioculturally situated, embodied, and distributed cognition at its most elaborate. Tango is far more complex than a single moving body. It goes well beyond more limited kinds of bodily interaction like cooperating in housework, as the actions of tango partners interpenetrate each other continuously. Tango is designed for embodied *co-regulation*: continuous reciprocal causation between partners in unbroken bi-directional communication (Fogel 1993; Fogel *et al.* 2006). Other examples of co-regulation include a person walking past a stranger on a narrow sidewalk, a mother interacting with her child, two persons engaging in sex, and someone greeting an acquaintance. In all these interactions, perceptual feedback interpenetrates feedforward action; feedback is received even while actions continuously modify the configuration. Tango resembles such mundane forms of co-regulation in some ways; but it represents a more sophisticated system. Dancers need to be trained over years to work quickly, in proper form, whilst maintaining improvisational creativity.

The following section presents a sketch of tango, notably its specificities as a social dance and the way it works as a communication system. The third section introduces my methods and makes a case for analyzing multimodal data on image schemas. The fourth section turns to the central issue: how improvised interaction gets enabled through good rapport with one's partner. Many fundamental tango techniques are relevant to ***contact***, beginning with principles of individual posture, attention, and receptivity, and ending with principles involving the whole dyad. The fifth section extends this inquiry by exploring the micro-dynamics of active sensing and incremental action, in a ceaseless loop with the partner; it also presents key methods for analyzing co-regulation via a phenomenology of expert knowledge. The final section relocates tango within the field of intersubjectivity research as the paradigm for an under-studied form of enactive cognition (*cf*. Thompson 2007).

TANGO ARGENTINO

Tango argentino is an improvisational pair dance, with a leader and a follower.[4] It requires a strong connection between partners and strong adherence to form, yet allows a great deal of creativity (*cf.* Turner 2006, Olszewski 2008, Hess 2009, Manning 2009b). This contrasts sharply with ballroom tango, with its fixed repertoire of figures. *Tango argentino* dancers meet at venues called *milongas* to improvise, usually taking several partners over the course of an evening. Most dancers take regular classes with professional teachers, often over many years. In *tango argentino*, partners face each other in a fluid, often close embrace that varies by style. A typical tango encounter lasts three to ten minutes, comprising an evolving sequence of improvised joint action that might involve walking to the beat, pivots, 'eights', mutual circling, leg crosses, 'invasions', leg hooks, 'flying legs', tilts, poses, small jumps, and any number of decorative 'flourishes' with a momentarily free leg.

Tango argentino allows infinite combinations of real-time joint improvisation, driven by the flow of music. At the same time, this happens within a strongly constraining form, manifested in the belief of accomplished *tangueros* and *tagueras* that many movements are 'un-tango-like'. Good dancers postulate a 'correct' form, even if complete agreement is rare about some details.

Figure 1: A milonga venue.

Tango is to be considered first and foremost a dialog: a ***game of question and answer***. The leading partner offers his follower ***invitations*** (or ***markings***) to fill a freed space. He signals his intentions with a measured, but directionally very precise *weight projection* of his body and other means (see below). The follower picks up this information and executes her response with leeway for pauses and adornments. Despite the fact that so-called ***interleading*** can be cultivated, the roles of leader and follower are essentially asymmetric. While there is much overlap in the basic technique – e.g., in the need to control the body axis – there are notable differences both in task-specific skills and

[4] Traditionally, the leader has been male, the follower female. This continues to be the most common role distribution. While female leaders have become a common sight in some places, considerably fewer men follow. I will try to choose my terms as neutrally as possible but will sometimes, as here, use 'he' and 'she' for succinctness.

the broader inner attitude required. Followers are responsible for interpreting the lead and providing clear feedback. They must also ensure a continuous, albeit subtle, bodily receptiveness that allows near-simultaneous reaction to the lead. This requires a somato-cognitive mode of being completely in the 'here-and-now'. One of my informants described how ***wanting and thinking dissolve***; another spoke of ***non-volition***. By contrast, leaders are responsible for providing feedforward information, planning ahead, interpreting the music, and navigating the couple around the dance floor. Since leaders 'invent' the dance, their somato-cognitive focus needs to be a split second ahead of the moment. Many devote effort to conscious planning and even master improvisers with automatized skills, who let the music flow into their body in real time, need a projective intentionality and an anticipative awareness.[5]

A tango dancer's knowledge has remarkably complex structure on at least three levels: (a) a repertory of specific step sequences, their elements, and nodes at which they connect; (b) attentional, postural, and kinetic techniques for tango movement; and (c) intersubjectivity skills for receptivity, partner sensing, and maintaining contact. The latter category subsumes skills for modulating somatic moods in order to make oneself open to one's partner.

The language analogy

Tango can be likened to the way language permits an infinite number of sentences by means of a flexibly deployed grammar. It imposes a strict form on creative expression – much as grammar imposes strict form on the *how* of discourse, even as the speakers are free to shape the content: the *what*. Tango 'grammar' may be seen in principles of posture and balance: 'grammaticality' decrees that the torso be upright and in axial alignment without bending; the 'outer' muscles move around a relatively fixed and strong body core; weight distribution must be clear at all times; weight falls on the forefoot for manoeuvrability's sake; upper and lower body may dissociate, but only in an upright twist – never by folding; steps may only proceed in the four cardinal directions: oblique steps are off limits. Consequently, any direction change requires a pivot with a full realignment of the front of one's body. An example of bad 'grammar' is letting one's arms move out of their permissible plane. More advanced 'grammar' includes kinetic techniques conducive to good dynamic posture, the use of body weight to generate energy for steps, correct positioning *vis-à-vis* one's partner, and well-coordinated muscle activation to enhance one's ability to read one's partner correctly.

At the same time, tango 'phrases' are made up of relatively free sequences created in syntax-sanctioned ways. Any coordinated (i.e. dyadic) improvisational element is made up of a complex combination of jointly made forward steps, backward steps, side steps, and pivots; as well as *mixes*, in which the leader executes one movement and the follower another. With respect to their individual

[5] Roughly speaking, experienced dancers distinguish two modes of awareness: one that involves conscious planning; another that is more seemingly effortless: the motor system takes over and lets the dance flow from the music's pulse. The better a dancer has developed her technique, the less consciously reflected upon the dance *needs* to be: with expertise, skills frequently 'disappear' into the body (Dreyfus and Dreyfus 1999). This certainly need not mean that no complex representations are involved.

bodies, dancers, too, possess knowledge about and make use of 'morphemes' of e.g. weight projection, axis shift, torso realignment, and shoulder opening (see Figure 2). Successfully improvising leaders fluidly connect and blend these elementary 'morphemes' to create the desired effect in the follower, while followers react to the most minute 'morpheme' changes with heightened sensitivity. Accomplished dancers are able to activate these 'morphemes' independently, both dyadically and individually. Only the less capable dancers are restricted to multi-element scripts – analogous to collocations or idioms in speech – lacking the ability to break them down and rearrange them.

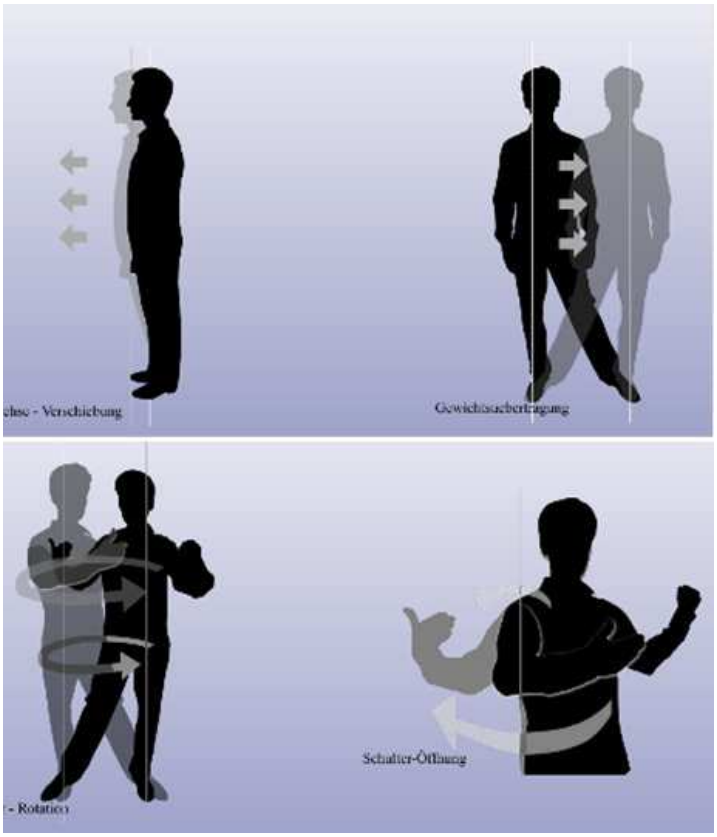

Figure 2: Elements (morphemes) for the lead (© Milite 2007).

The language analogy extends further to pragmatic rules of discourse, the most basic of which is the rule whereby the leader corrects mistakes as they occur, and the follower waits for him to initiate. Confusion typically results when followers initiate a correction. Compare two people in a narrow corridor or on a narrow pavement shifting together three or four times consecutively, as both attempt to anticipate the other person's next move. The role-based task distribution in tango is meant to avoid this kind of misunderstanding. As a final aspect of the language analogy, consider the fact that new partners are sometimes characterized as having an unknown ***dialect*** or using ***idiosyncratic expressions***; while dancers who dance together regularly tend to develop a ***private language***. This is why changing partners is considered so important for mastering the ***tango language***.

Tango as a cognitive-behavioural system

One needs to understand tango both as a refinement of natural organic motion and as a cultivation of new motion principles. The tango system rules out many possible movements. It limits degrees of freedom (*cf*. Bernstein 1967), rendering most limb and torso positions illicit while creating specific channels into which the partner's impulses flow. One does not find the same limitations in contact improvisation, and one finds them only to a moderate degree in other social dances; although other disciplines, like aikido or capoeira, are essentially like tango. Learners of tango need to distinguish *structures of freedom* from *structures of constraint.* They learn this gradually, through trial and error and technical corrections by teachers. A *direction of freedom* might be a plane in which the arms legitimately can move or a position to which the foot legitimately can go; other planes and positions violate tango grammar, either aesthetically or functionally. Adherence to form is the very pre-condition for improvisation, because of the way it affords 'processing reductions' (Pressing 2001). An interesting observation follows: *dancers reduce their degrees of freedom to understand their partners.* Accomplished dancers dancing with novices – who exercise nearly their normal, everyday degrees of freedom – often experience the communication to be very strenuous, much as when one person speaks a language and the other does not. The super-individual system that is tango works best by respecting clear constraints: 'the more I limit myself, the better we will do as a couple'. The more complex and timing-dependent an interaction becomes, the more central is form and what I call *structured improvisation*. Respecting the constraints on tango form does not imply self-abnegation: leaders who are too 'polite' and too eager to accommodate the follower weaken the lead. Firmly sticking to one's axis provides better guidance that bending towards the follower to assist in a difficult movement. Conversely, followers should ***hold their ground*** and react only to unambiguous signals. The required constraints on tango motion can be expressed in terms of non-linear dynamic systems theory (Kugler 1995, Thelen & Smith 1994, Handford *et al*. 1997, Marsh *et al*. 2006, Richardson *et al.* 2007: 846), where they comprise a complex *order parameter* with the power to 'enslave' all the more specific aspects of the system – analogous to the ambient temperature that defines reactions in a chemical system. Maintaining the order parameter within a defined range lends dynamic stability to the system as it shifts from one task to the next: in effect, good body habits. Later in this paper, I investigate how dancers create such good habits through imagery.

Tango structuration occurs as a form of *distributed cognition* (Hutchins 1995). Leaders and followers know, sense, and do different things. Their tasks are often asymmetric. The whole works, because the two bodies are mutually calibrated. This systemic fit had long had a mystique for me when I began to dance as a leader and observed how things worked out with followers whose rules I barely understood. Dancers who prefer only one role – leader or follower – are socialized into a systemic whole, which they can never fully understand from the other perspective. Still, it works for them. The asymmetric role distribution has an important but unfortunate consequence: moderate leader skills are

generally more detrimental than moderate follower skills. A good leader with a less experienced follower can lead a good dance. One rarely sees the converse.

Within the described system configuration a specific mode of active engagement is called for, which Walter (2006) describes as an awareness exercise cultivating a particular somatic and attentional mode of being. The partners tune to each other and the music, sometimes to such a degree that ***body boundaries dissolve***. Movement as a couple affords gratification that movement as a solitary individual does not. A continuous, reflexive awareness is required from both roles: a 'third-order attention' that has the other's attentional state as its object (Zlatev *et al.* 2008). Good leaders sense whether their partner is sufficiently aware of their lead so that they can, if needed, make it clearer, or re-establish communication in cases of temporary breakdown. Good followers sense whether their partner receives enough feedback and whether their own actions correspond to the invitations they receive.

I wish to mention one final tango parameter: *multitasking*. The leader must interpret the music, navigate the dance floor to avoid collisions, feel and direct the partner, and sense his own body in relation to all these parameters. In phenomenological parlance, the music must be heard *as* tango music, the partner's body felt *as* a tango body, one's own body organized *as* a tango body. In systems theory parlance, individuals must achieve and integrate *structural coupling* at multiple levels.

I focus in this paper on tango space, kinetics, and body, and bracket out music skills. Tango musicality would require an article in its own right. In any case, one must master bodily contact skills to some relevant degree before one can move with the music. Undeniably, music helps partners synchronize; it 'lends urgency to the moment' (Manning 2009a: 16); its rhythmic beat exercising stabilizing constraints (*cf*. Papousek 1992, following Schögler 1999). At the same time, when a dancer goes with the music only, this may create confusion or frustration. Especially, followers who indulge in interpreting music as they hear it without sufficient attention to the lead (i.e. to how the leader hears the music) quickly become unpopular, even if they have superior musical skills. One may therefore say that the music 'fine tunes' the bodily communication signals, but should not do more than that.

EXPLORING SITUATED BODY KNOWLEDGE

My phenomenologically inspired approach focuses on the sensed, 'thought-felt', actively created structures of bodily encounter. The resulting methodological difficulty is twofold. The average tanguero/tanguera talks profusely about recent tango experiences, tango's significance to them, and what the gender aspects of tango mean, along with related personal or psychological issues. At the same time, the highly specific body knowledge that dancers self-evidently possess is often fleeting and tends to remain implicit, especially for those who are not very verbal. Also, it is often easier to talk about general knowledge than a particular situated experience with a particular partner at a particular time. Clearly, data elicitation methods are needed that tap into implicit and situated knowledge.

Methods for probing the implicit

I propose a merger of linguistic, phenomenological, and ethnographic methods. First-person methods are one key approach: namely, my own immersion in tango as a 'researcher-apprentice' of six years' experience. For more than four years now, I have kept an introspective diary (over 300 pages) of my progress as a tanguero with my principal teachers, Germano Milite and Betka Fislovà.[6] I dance two or three times per week, mostly (but not only) as a leader. By keeping my journal regularly, I have honed my introspective abilities, giving my entries increasing depth and length as I have grown more familiar with tango 'theory'. In retrospect, my immersion in tango has been a *sine qua non* for entering into micro-analytic dialog with other dancers. It has given me terminology to talk about tango bodies, as well as greater knowledge of anatomy and even tango 'physics'. It has familiarized me with typical learner difficulties, allowing me to relate to those I interview and ask the right questions. It has given me a growing aptitude to explore, with focal sensitivity, the micro-processes of my body and those of my partners. My teachers have provided me with critical technical principles and concepts, even as I have been at pains to discuss, understand, and test their precepts through an evolving dialogue. I have interviewed my follower-teacher Betka and arranged with my leader-teacher Germano a four-hour knowledge-structuring task: a relational mind map, after (Lippens 1997). I involved both of them centrally in planning and analyzing a motion-tracking study I conducted in collaboration with the Department of Sports Sciences at the University of Vienna. Although I may be biased towards their views of tango contact, I am also familiar with the teaching methods of five or six teacher-couples.

As a second data source, I have gathered second-person data from both teachers and learners. In the early stages of the project, I used seven teacher interviews as a foundation, later complemented by two-hour teacher interviews on didactic images and 30-minute interviews on walking (4+6 sessions), done following the motion-tracking study. Most of my present data comes from 90-110-minute micro-analytic interviews with sixteen learners from Hamburg, Vienna, and Graz, addressing technique learning; learning difficulties; interaction experience; and, finally, partner contact. Of these sixteen, five were interviewed diachronically (2-3 sessions) to document changes in their apprenticeship after intervals of 7-12 months. Each semi-structured interview took the form of a maieutic dialog to elicit embodied experiences and flesh them out in detail. I adapted techniques from *empirical phenomenology* (e.g., Pollio *et al*. 1997), intending the term 'phenomenology' in a broad sense as any first-person or otherwise introspective approach to experience – and not necessarily in the sense of *phenomenological reduction* (see Varela & Shear 1999).

I have relied most heavily on the methodology of Petitmengin (2006), who sought to focus the interviewee's attention on a unique experience: in my case, an exemplar of one or another tango

[6] This has precedent in phenomenological apprenticeship research (Rothman 2000, Wacquant 2003, Downey 2005, Potter 2008, Samudra 2008, Tarr 2008), by which ethnographers undergo formative experiences in e.g. boxing, capoiera, Japanese or Javanese martial arts, or dance. Ethnographers of both *cultural sensory formations* and ritual defend the importance of embodied participation (Stoller 1989, Wikan 1991, Lindquist 1995).

technique. Normally, the fleeting nature of conscious awareness makes it difficult to arrest attention or re-experience in detail aspects of bodily experience. Dialogic interviewing techniques assist this process – sharing key aspects with the techniques of *focusing* (Gendlin 2003) and *micro-analytic interview* (Stern 2004). Petitmengin recommends posing 'how' in place of 'why' questions, sticking to topic, and firmly leading the conversation back onto topic whenever the interviewee veers off into general knowledge. The interviewer continuously situates the discussion in concrete terms by inquiring into sensorial impressions of context. Eliciting questions probe more deeply: the interviewer may ask if the experience can be located in the body, whether it can be divided temporally into sub-phases, what the general quality of the whole is, and what metaphors can be found to express it. Other questions concern what one senses in one's own or the partner's body, how one knows what the other has felt, or where one would localize feedback signals. When the interviewees claim they are unable to describe something, they are asked how they came to realize this or how they might describe the experience to a child or layperson. Alerting the interviewee to both paralinguistic and gestural behaviour affords increased self-awareness, especially of mental imagery. Offering dialogic assistance results in progressively more complete descriptions.

In a micro-analytic interview, the assumption is that even interactions of no more than several seconds – sometimes less – can be packed with dynamic cognitive and enactive patterns. The interviewee is requested to choose three or four vivid, recent interactive situations to discuss. These could be particularly instructive, or difficult, or gratifying; either unique encounters, or narrowly circumscribed ones. The interviewee is then asked to specify, for each interaction, the discernible phases or principle 'snapshots'. Over a period of 20-30 minutes, the interviewee is requested to detail each phase before moving on to the next – aided by eliciting questions from the following categories.

Contact: *How did you establish contact with the partner? How did you gauge the quality of contact? (If contact was temporarily broken) what did you do to re-establish the communication loop?*
Sensory configuration: *Were your senses actively configured; did they seek out specific impressions? Did you filter sensory information? How did you configure your body (posture, muscles, gaze…) to be receptive? How did your general action mode (e.g., improvisation) influence what you perceived? Did you actively modulate your or your partner's sensory dispositions to your benefit, that of your partner, or that of the dyad as a whole?*
Perceived affordances (action opportunities): *When in the sequence did you seek feedback; did you sense more actively at specific points? Did you need specific feedback to begin (or continue) this action; if so what? What feedback was needed to begin the next action? How does a clear 'go' signal for this action differ from a vague one? What did you focus on in the partner's body? How do you think the partner perceived your body? Could you directly feel if the partner perceived your actions? Did you always know precisely what was happening?*
Actions: *Did you act continuously or in pulses, cycles, etc.? Which goals did you actively seek out? What kinds of signals did you rely on for deciding what to do next? When did you realize that the goal had been reached? At which point in the sequence did you realize the next possible action and when did you decide it? Which prior actions from your partner are needed to afford a certain action? What constraints do you impose on your partner to make the interaction work? Do you execute micro-actions in a particular order? Are you sensitive to micro-timing?*

Node points for improvisation: *What are the main decision points for you in the sequence? Are there other kinds of orientation points? Which configurations can you exploit, on the go, when they arise? What phase do you visualize most clearly? What is most salient in memory? Where can you stop and reverse the action? Can you take away or insert parts into the sequence? When confused, what is your 'safe haven' to return to? What alternative actions could you begin at this point? Is there a best action choice in this situation? What is your second-best option? If this action plan is difficult to continue, do you enforce it?… what else can you do? What was your planning range? How many phases did your action plan have, and were they independent?*

Table 1: Eliciting questions.

My team and I used another second-person method: videotaping free practice, using a think-aloud method (Seiler 1995, DeSpain 2003, *cf*. Hurlburt & Heavey 2006). We invited couples to explain, to the camera, what they are doing while they are moving (five sessions of 120 minutes). In the breaks between dances, we asked them to elaborate their main challenges and the solutions they have found, along with aspects of their (often hardly visible) non-verbal communication. We used similar questions as in the interviews, with special questions for experienced leaders on nodes and action repertoires (see Table 1).

The various data sources proved complementary. Learner interviews and think-aloud sessions helped me to compare learning strategies and collect interaction vignettes: e.g., of imagery, as reported below. These interviews proved crucial for understanding sequencing constraints in improvisation and the improvement of a dancer's skills over time. Expert interviews were instrumental in understanding complex tango imagery and comparing technical systems taught by different tango teachers. Finally, my journal entries described a detailed personal learning trajectory and provided both a rich collection of metaphors used by teachers and virtually endless interaction vignettes.

Image schemas

The next issue is how to analyze the data in a way that reflects the task-specific expertise involved. In phenomenological studies of movement (e.g., Ravn 2009, Potter 2008), the subjects interviewed almost always comment on general issues such as how they 'use weight', 'perspectivize the body', 'employ positioning', or 'relate to space'. While the approach is legitimate, it dodges an important issue: how do dancers deploy more task-specific knowledge; what special cognitive skills are required? Consequently, other approaches become more helpful, because of their focus on task specificity: e.g., sports science imagery studies (e.g., Gröben 2000) or ideomotor approaches to dance that focus on vectors, centres of gravity, and lever principles (Franklin 1996).

I consider tools coming from cognitive linguistics most apt for understanding the imagery people move by. In this field, scholars of concepts, grammar, metaphor, gesture, and visual culture all have used *image schemas*: i.e., recurrent cross-modal gestalts of bodily perceptual experience. Following Johnson (1987), image schemas can be defined by their distinct topological or dynamic properties: e.g., a **CONTAINER** has an inner region, an outer region, and a boundary. Other examples include **UP-DOWN**, **AXIS**, **BALANCE**, **CYCLE**, **FORCE**, **FORCE BLOCKAGE**, **FORCE ENABLEMENT**, **PATH**, **CENTRE-PERIPHERY**, **PART-WHOLE**, **LINK**, **INTERVAL**, **SURFACE**, **CONTACT**, **SCALE**, **NEAR-FAR**, **LEFT-RIGHT**,

and **STRAIGHT**. Image schemas are distinct from rich, detailed images of a scene: rather, they contribute the dynamic scaffolding to such images.[7] To these specific descriptors, Langacker (1987) adds gestalt operations that define how image schemas are put to use dynamically: e.g., attentional profiling; perceiving traces as forms (e.g., when a trajectory appears as a wavy line); shifting focus within a scene; changing granularity by zooming in or out; shifting between off- and on-scene viewpoints; manipulating, configuring, or decomposing elements; and, finally, the frequent operation of superimposing new details onto an imagistic scaffold in order to progressively enrich it.

The interface of praxeological and conceptual knowing

Linguistic and psychological evidence shows that image schemas structure much of perception, action, and thought (Lakoff & Johnson 1999, Gibbs 2005). Although no studies of motion-regulating knowledge have been carried out,[8] image schemas have just the right format for facilitating such studies. Image schemas straddle the fence between bodily praxeology and concepts. Proprioceptive and kinesthetic tango skills reflect the praxeological and often pre-reflective level of cognition (*cf*. Ravn 2010). At the same time, reflexive imagery abounds in tango. Skills are often infused by image schemas of a more conceptual sort.

Of course, image schemas are not necessarily close to linguaform awareness – not at first and not always. While they may reside normally only at the threshold of reflexivity, they are, in principle, capable of crossing it. In fact, this is the rationale behind my methods. I have experienced many times how the maieutic dialog I employ allows the interviewee to bring to focal awareness gestalt patterns that were previously only semi-conscious. Tango instruction can also throw the interface between bodily and conceptual knowledge into relief. Teachers frequently draw upon imagery they feel in themselves; put it into language, gesture, or sound; and thereby attempt to infuse the gestalt into the student's body image, so that, by trial and error (typically over several cycles of dialogic exchange), the student appropriates the imagery to her own body.

Introspection suggests that improvised dance is similarly generated. As a follower, my stream of consciousness, in monitoring the unfolding tango interaction, provides momentary flashes of image-schematic properties of posture and motion – but also attention and perception. When I lead, I project this imagery ahead in time, for motor planning. Imagery works by projecting a motion trajectory, deviation from which can be directly sensed and corrected at any time. A related kind of immediate, dynamic feedback is provided whenever dancers project topological configurations, like a fixed

[7] Image schemas are cross modal: they connect visual, aural, tactile, and proprioceptive-kinesthetic modalities. A force heard in music can be transposed into kinesthetic force. A visual impression of a teacher can be proprioceptively mirrored. An instructional gesture can be projected from the hands onto the whole body. A further asset to the image schema approach is that it tends to see motor perception, preparation, and enaction in continuity with each other, as different stages of the actualization of a gestalt.

[8] Existing studies tend to focus restrictively on "shape or movement *X* stands for" types of meanings (Gibbs 2003, Edwards & Bourbeau 2005), or to remain descriptively sketchy when they target performance proper (Palmer & Jankowiak 1996). Of course, in tango, the *meaning of doing* is primary.

relative distance. One can say that recurrent tango elements have a dynamic gestalt-like topology in the body, in space, and in time.

Finding image schemas in multimodal data

How does one determine image schemas? Here are interview excerpts translated from the German with the topology- or force-related cue words underlined:

…To recognize if the partner feels sure or not.… I often recognize this from the torso of the partner; how permeable a partner is. (BK 55:00)
Normally, I believe, the axes are always oriented towards each other. You can then think of an axis that runs from the head down to the feet, respectively. I think it runs only to the torso. (JA 45:07)
[The orientation point when perceiving the partner] *runs from breastbone to breastbone.… When this connection is there, there also is a more or less clear connection between the other body parts, the shoulders, the hips.* (JW II 27:30)
When I know the principle, where is the rotation at this point?, do I circle around this person? Do I have to turn in that angle; do I have to act like this, can I be more upright…? I kind of imagine this as geometrical figures in 3-D… like cylinders. Two reels next to each other: sometimes they turn around each other, and sometimes they both turn around the same [point], and sometimes one person is in the centre and the other has to walk around. (BK 11:20)

Table 2: Interview excerpts with underlined image schema words.

Clues about image schemas are to be found in metaphors and technical concepts, in verbs and prepositions, in gestures, and in onomatopoeia. Instructional metaphors or metaphors used to describe a dance experience are probably the most frequent data source. Many metaphors specify a body part into which an image schema is projected: e.g., ***your sternum is linked by an invisible shaft to your partner's***. Other metaphors lack a concrete bodily locus or otherwise characterize an emergent appreciation of the situation as a whole: ***this felt round***, or ***we seemed well grounded***.

Image schemas appear in gestures, like shaping a hinge with both hands to express a twist; pointing some distance; illustrating a motion vector by thrusting; or illustrating a kinetic modality with a waving motion. Once grasped, technical concepts evoke image schemas that refer to body topology, body positions, or body vectors: e.g., ***being in axis***. Verbs evoke image schemas about the manner of motion: consider the difference between ***walk***, ***amble***, and ***sneak***. Prepositions like the 'to' in ***taking the impetus to my centre*** or the 'from' in ***the motion flows from*** add topological specificity.

Finally, sound patterns – like the vocal crescendo in ***TaaAAAAaaaa*** – can be used to emphasize energy expenditure over time; rhythmically accentuate a motion; or employ the contour-like properties of sound in related ways (*cf.* Stern 1985). Even a sudden vocalization may have an image-schematic quality when used to mark an interval in an ongoing movement.

The complex geometry of motion

This image-schematic approach is adequate to a phenomenology of motion skills only if certain further points are accepted. To avoid reductionism, one must conceptualize image schemas as intentional, motivation-imbued, dynamic, (often) compound, task-specific regulators, unfolding against the

backdrop of the general body topology or environment – rather than occurring in a 'neutral' Euclidean space. Only *situated image schemas* (Kimmel 2008) are faithful to intentional structure, by requiring one to describe the context – aim and setting – before saying how an image schema is used. One must further specify the topological locus: inside the body or out in space; temporal dynamics; and perspective to be taken on the scene. One must also keep in mind the mutual enrichment of image schemas to full, complex gestalts: even small tango elements, like steps and pivots, are complex – they require attending to different body parts and extend over several stages. Analysis is done by piecing together clues from several image-schematic expressions that, together, co-specify the movement: e.g., to execute a tango pivot on one leg, a beginner needs to attend, nearly simultaneously, to at least the following aspects.

Image schema		**Maps onto (= functional role)**	**Evidence in metaphor**
DOWNWARD PUSH FORCE	→	Better balance by relaxing knees and hips	***drive yourself into the ground like a screw pull***
UPWARD PULL FORCE	→	Bringing upper torso into precise axis position, stabilizing muscles	***(while your lower body goes down), your spine expands upwards like a*** **bandoneon [=** ***tango harmonica*****]**
AXIS, CIRCULAR CENTRE	→	Alignment of ball of foot, knee, hip, and shoulder	***make your supporting body half a column***
FORCE ANTAGONISM	→	Execution by 'loading' a muscle chain with potential energy	***load the torso up like a coil by holding the hips in place while twisting from the breastbone***
LINK between body PARTS	→	Connected abdominals and *latissimus dorsi*	***imagine you are a truck driver turning a big steering wheel with the whole body***

Table 3: Compositionality of image schemas and metaphors.

A complex, dynamic pivot-gestalt arises from the configuration of all these elements.[9] Another good example of the compositional assembly of mutually specifying image schemas is a straight **PATH FORCE VECTOR** issuing from one's centre of gravity – a point of inner **BALANCE** – directed past (**NEAR-FAR**) the partner's **AXIS** at a certain **ANGLE**. In this way, elements of motion create dynamic gestalts with a unique feel (Klemm 1938). At the same time, they have elements that many teachers and advanced learners are able to decompose – be it for better awareness of elementary functions, or out of a pedagogical need to be delivered piecemeal.

Methodological benefits

Whereas sports sciences and dance studies typically understand imagery as *rich* imagery (e.g., Hanrahan & Vergeer 2000, Nordin & Cumming 2005), image schemas, as noted earlier, focus on certain invariant topological and kinesthetic gestalt properties that inhere in the selfsame rich imagery, usually such that a given image schemas is shared by superficially different instances of rich imagery.

[9] Note that, on occasion, a good metaphor may already combine several – though hardly ever all required – topological aspects: e.g., the ***opening bandoneon*** can be used for both the upwards and downwards movement of the body.

This has crucial advantages. (a) A single image schema may be reflected in multimodal data, allowing one to see equivalences between senses: e.g., that visual, musical, and kinetic **FORCE** are connected; or that a sharp rhythmic contour, a sharp gesture, and the words ***sudden burst*** reflect the same topological pattern. (b) Within language data, image schemas bring out functional equivalences between superficially unrelated rich images in different explanations of a tango concept. The metaphor ***drive a screw pull into the ground*** is nearly equivalent to the technical explanation ***concentrate all your force on a single spot and send it downwards to stabilize your axis***. Extracting image schemas allows one to see the motion vectors or spatial configurations that these expressions share. (Later, however, I shall show that other kinds of gestalt imagery are needed as well for a full description of tango skills.)

IMAGERY FOR INTERACTION

I shall now apply this gestalt framework to address how good body habits and technique (Valtazanos 2009, Arvind & Valtazanos 2009) license embodied tango dialog: in particular, how image-schematic skills enable continuous rapport between partners on several concurrent levels. Proper contact with the partner and dynamic stability arise from the dancers' ability to master a matrix of image schemas. My argument traverses three levels. On one level, image-schematic skills enable each individual to organize her body with proper attention, posture, muscle tension, energy management, and kinetic habits (i.e., tango 'body grammar'). On another level, a proper technique for joint walking creates an integrated super-individual system and prescribes ways of maintaining rapport at each stage. Finally, regulatives at the dyadic level mark specific points in the attentional flow, provide geometric pair configurations to stick to, and provide images for monitoring the couple as a whole. I now present a selection of metaphors for each of these levels, building on the assumption that even dancers who learn through imitation or trial and error, rather than verbal instruction, use the gestalts underlying the metaphors.

Enabling backdrops: tango *habitus* and somatic modes

Recall that dynamic tango contact can only work thanks to a set of general constraints that the dancers impose on themselves, whereby they radically limit their bodily degrees of freedom. Dancers assume the tango *habitus* the moment they enter the tango embrace. Specific muscles, habits, and attentional structures instantaneously kick in and remain (pre-)activated throughout the dance. *Habitus* means 'living in the flesh': the basic principle of functional tango anatomy and energy deployment. Without the enabling backdrop of *habitus*, interaction in all the more specific tasks would be strenuous or impossible. (See my earlier remarks on the limited degrees of freedom and order parameters of the tango body.) A proper tango *habitus* includes being in axis (**AXIS BALANCE**, **UP-DOWN**); channeling energy downward (**CONDUIT**, **DOWN**); concentrating energy in the body core (**FORCE**, **CENTRE-PERIPHERY**); aligning hips and chest (**PARALLEL VECTORS**); or, alternatively, 'loading' the torso (**KINETIC FORCE ENABLEMENT**) in a planar dissociation of upper from lower body (**PLANES**, **AXIS**,

PART-WHOLE, **UP-DOWN**, **CENTRED CYLINDER**). I return to some of these later. These and other schemas define the general bodily semiotics of tango, enabling communication in the first place.

A complementary aspect of good tango *habitus* relates to the general somatic modes of attention that are conducive to contact. Although practice of awareness is no complete guide to acquiring intersubjective skills, it plays an important role. A dance starts with how one approaches one's partner: openly, with reservations, tenderly, nervously, etc. One informant said that following means ***being with the partner*** and ***not expecting or intending anything***. At this level, dancing together is a mode of *being in the world*, as the phenomenologists would say; or it is an *awareness technique*, as meditative traditions would say. Dancers often emphasize an accepting or loving attitude as crucial. This attitude is quite somatic: a lack of it makes one tense and inflexible when things go wrong. More broadly, one's attitude shapes the quality of the embrace. After all, when one hugs friends, one usually does so not rigidly but supplely. Accomplished dancers are aware of subtle dispositions that help them connect. These *somatic modes of attention*, as Csordas calls them (1993), encompass general ways of attending to oneself, to other bodies, and even to others' attending to one's own body. Many of these somatic modes have something image-schematic about them, as clearly revealed by the expressions **[overcoming]** ***tenseness***, ***closedness***, or ***inner dispersion***, or being ***grounded and focused*** or ***even tempered***. The same is true for general attentional skills. Leaders often distribute their attention equally between themselves, their partners, and their space, the trick being not to **PROFILE** any sensory input too much but rather maintain a holistic awareness.

That said, more matters than just image schemas. Returning to my earlier linguistic analogy, somatic modes may be likened to discourse modes. One can lead ***monologically*** or ***dialogically***. Good leading is facilitated by consciously reminding oneself that one does not simply replay one's repertoire; the partner's feedback is relevant at each stage, before the next movement can ensue.

General posture and kinetics

Muscle- and skeleton-related imagery creates a proper tango posture, a key to which is ***being in axis***, which comes with feeling ***a vertical rod through your body***. A typical instructional metaphor might be ***imagine yourself suspended from a string attached to the top of your skull***. Teachers often encourage students ***not to break the body line*** or to ***align balls of feet, knees, hips and shoulders***. Such a posture gives micro-muscular support to the torso and provides stability against external forces. The aim is completely balanced uprightness – even when standing on one leg. The upper body should remain **VERTICAL** and **STRAIGHT** even when one is tilted forward over the balls of the feet: i.e., no inner bending of the torso. This recruits the image schema of **AXIS**. In addition to the body's topological organization, there is the requirement of dynamic axis control: one must keep one's body in near-perfect **FORCE BALANCE:** i.e., no uncontrolled lateral or forward pull should be felt (Johnson 1987). When this has been mastered, a dancer is able to transfer weight in a perfectly controlled fashion.

Often, dynamic axis control is understood relative to the partner. Followers are encouraged to ***answer*** or ***mirror*** the leader's forward projected weight with an equal amount of weight. If my partner brings her axis forward, I will do the same, to create a feeling of proper contact. Dancers jointly maintain a systemic **FORCE BALANCE**: i.e., a dynamic balance principle modulates the weight system of a two-axis ensemble. This calibration allows dance figures in which both dancers renounce their own balance while their combined displacement creates systemic balance.

When talking about dance figures or positioning, dancers often think of the axis as a vertical line travelling through space relative to the partner's axis, often ***on a grid*** or ***in geometric patterns***. The axis *essentializes* where the dancer is located, so she can judge distances or trajectories relative to the partner. The heuristic is necessarily abstract: an image of two axes relative to one another cannot provide full orientation about the pair's configuration. Dancers also need information about the way the bodies face each other: opposite, off-centre opposite, rhomboid, V-shape, T-shape, etc.

Further skills relate to how the axis shifts as the dancers walk. In every step cycle, there are at least two positions that capable dancers recognize as distinctive and use for orientation: (a) the position of one's torso with the centre of gravity moving over a single supporting leg and (b) the open middle bipedal position with equally distributed weight support. Both 'snapshots' of the **CYCLE** are part of an **INTERVAL-PATH** schema; the cognitive ability to recognize and emphasize these points requires special muscular and attentional **PROFILING** (see the discussion on *node extraction* on Page 108. In the unilaterally supported position, dancers build a firm muscular **column** or ***tower*** over the hip of the supporting leg, while the other leg is relaxed and free to swing ***like a chain / like a heavy rope***. The torso must be fixed, briefly but decisively, over the hip joint, such that it is possible to lift or swing the free leg and stand perfectly balanced (**AXIS**, **BALANCE**, **UNILATERAL SUPPORT**).[10] With the next step cycle, muscular activation travels to the other hip and leg – what can feel like a sudden ***switch on, switch off*** when the music is fast. The result combines, in one **CYCLE**, the **(A-)SYMMETRY** and **TENSION-RELEASE** schemas with an axis that wanders between ***two tracks*** (**PARALLEL PATHS**, **LEFT-RIGHT**).

Kinetic efficiency in the forward walk is achieved by a ***controlled falling***. This is done by bringing the centre of gravity forward over the ball of the supporting foot (weight projection), using one's leg muscles to hold one's weight back, then suddenly releasing it (**FORCE**, **BLOCKAGE REMOVAL**). Only a fraction of a second before falling, the free leg swings forward. The torso remains upright and controlled throughout (**UP**, **AXIS**). Step energy builds like ***floodgates under pressure that are suddenly opened***; it is as if one wanted ***to move right through the wall***. The body should fall ***on a plane*** (**PLANE**), not into the ground. For initiating the vector from the right spot, it is good to imagine ***a string attached to the centre of gravity*** around the navel, which pulls horizontally – or, better yet,

[10] Apart from serving the functional anatomy of tango, this has interesting semiotic implications. The basic posture-weight system of tango aims at a maximized distinction between left and right. Dancers typically differentiate their axis positions more than in most everyday walking. Sticking to these unambiguous positions enables swift communication and avoids mishaps.

slightly upwards.[11] Other walking techniques – especially those of the *tango nuevo* style – employ less controlled falling. Their low basic posture – knees bent – allows controlled pushing through activated quadricepts and gluteus muscles, while their antagonists remain active throughout. One teacher I know speaks of first lowering the body like an ***elevator,*** then employing a ***forward-pushing*** vector.

In many kinds of tango walk, one sees a ***counter-body*** motion by the torso: the right shoulder is retracted when the right leg extends forwards, and *vice versa*. This serves purposes beyond the purely aesthetic. First, the upper body is kept in perfect balance through the counterweight that the retracted shoulder creates. Second, muscular 'spiralling' stabilizes the inner axis (**FORCE**, **SPIRAL**). Third, the counter-body motion anticipates a pivot at any given time without additional muscular preparation (**KINETIC ENABLEMENT**) – especially for followers who want to maximize their reactivity. Fourth, the lead benefits: the degree of the counter-body motion signals the step phase to the follower. Fifth, the counter-body position is an aid for holding the leader's weight back for a moment, then suddenly releasing it, thereby accentuating the step.

Common imagery for the counter-body motion includes ***a seesaw***, ***a pair of scissors***, ***a lever***. For a good vertical connection between lower and upper body, the dancer may imagine a stick that pulls the shoulder back, when the foot advances by means of a hip-level fulcrum (**BALANCE ON FULCRUM**, **LINK**). One might also visualize two diagonal ***rubber bands***, one which pulls the right shoulder forward when the left foot extends, and one which connects the left shoulder and right foot likewise. Meanwhile, for left-right coordination, one can visualize a horizontal ***rod*** that rotates on the thoracic vertebrae, pushing one shoulder forward while the other retracts. Finally, for 'spiralling' the abdominal and other muscles, one can imagine either a spring or a towel (**TWIST**, **CENTRED CYLINDERS**, **AXIS**).

Inner body organization for receptiveness

A specific pattern of distributing muscle tension is crucial for properly connecting the upper body to the legs. Accomplished dancers maintain high core tension in the deep muscles of the torso while keeping the shoulders relaxed (***dripping wax***) and arms active (in ***a hoop growing out of the shoulder blades***) – but never tense (**CENTRE-PERIPHERY**, **FORCE**, **SCALE**). Core tension implies a distribution pattern: i.e., an attentional **PROFILING** of the highly activated muscles as a **WHOLE** with **PARTS**. Probably this is memorized as a tension ratio between core and periphery rather than an absolute value. A more sensitive partner allows one to scale down muscle activation proportionally – via **SCALE** image schemas that modulate **FORCE** – while preserving the gestalt of the relative distribution. Scaling down is recommended by many contemporary teachers, who emphasize organic moving, efficient use of energy, and relaxation.

[11] To picture each step clearly, it helps to imagine releasing the force through a narrow conduit (**FORCE VECTOR/PATH**, **STRAIGHT**, **CONDUIT**), defined relative to one's own body front. Precise paths help with differentiation of linear from circular moving, which is imperative in tango (**PATH** vs. **CIRCLE**).

A partner with core tension can be felt as a stable unit – even as ***a monolithic/heavy object*** (i.e., **SOLID OBJECT**). Novices tend to increase arm pressure or fixate their shoulders when they feel loss of contact with the partner. Maintaining high core stability solves this problem with much less effort, because the partner's entire body is felt as one whole.

When dancers assume an open embrace, arm activation presents a further challenge. Only activation within certain bounds creates receptivity. Too little tension allows the incoming information from the partner to ***vanish in thin air***; whereas exaggerated tension ***smothers*** signals at the elbow or shoulder before they get ***passed on***. The arm muscles need to be ***permeable*** (rather like ***antennae***), so that energy is ***collected*** in the torso – where the centre of gravity is located. A related receptiveness technique activates the *latissimus dorsi* and smaller lateral muscles in a kind of passive activation that relies on the muscles' elasticity. A passively activated muscle first stores kinetic energy up to some point, before smoothly releasing it: corresponding to what Johnson (1987) describes as **FORCE ENABLEMENT**.

Well-trained dancers create muscle chains that transmit incoming signals from the embrace to the legs. When the leader subtly initiates a forward step, his impulse should cause an immediate reaction in the follower's free leg, making her respond to every small increment of his weight with the same amount of leg extension (details below). Because the lead is ***caught up*** through chest and shoulders, ***sending*** this information downward to the feet with minimal delay is imperative. Followers in particular cultivate a muscular organization that channels incoming energy **DOWNWARDS**. This may be facilitated with imagery of energy flowing through body channels, such that the lead's **FORCES** pass ***undissipated*** through a **CONDUIT PATH** to an **END /RELEASE POINT** of a kinetic chain – often along a body diagonal – that begins in the leader's torso, continues via the open-embrace arm into the follower's left shoulder, runs down her back, and ends in her right foot. A similar chain can be found on the closed side of the embrace. Besides ensuring that the leader's action feeds forward, the chain also provides sensory feedback to the leader: a real-time awareness of the follower's every movement, such that her leg action can be minutely felt via the shoulder blade.

In addition to their default pre-activation, muscles are often activated in small pulses during task-specific routines. In the tango walk, relaxation alternates rhythmically, as muscle activation shifts between the left and right side of the body (**PROFILING**, **ASYMMETRY**, **LEFT-RIGHT**, **TEMPORAL INTERVAL**).[12] My teachers have sometimes marked the activation pulse with their voice or made a buzzing sound when bringing contact fully to one side, which onomatopoetically creates an electricity metaphor, as does the verbal ***switch on-off***. To mention another example, sudden activation of the inner abdominal muscles (**PROFILING**, **INCREASING FORCE**) helps when a strong impetus requires added stability and receptivity – especially in pivots, quick steps, and sudden braking. Tension

[12] Generally speaking, experts activate their muscles only after surpassing a certain threshold (**SCALE**). Analyzing the learning curve, one sees that better dancers are able to work more efficiently with less strength. It is well established that bioelectric energy in the muscles decreases with increased training – especially as concerns the relaxation of the antagonist while the agonist is active. High activation speed in the agonist means that overall tension can be kept lower before activation sets in, further saving energy (Loosch 1999: 187).

typically kicks in – all the way from the shoulder to the lower abdomen (**LINK**, **SOLID OBJECT**) – enabling the navel-hip zone to react without delay to the signal transmitted via the embrace.

Walking together

Consider what is, for many, the supreme tango skill: joint walking. Kinetic efficiency and contact are a matter of ***remaining with the partner*** throughout, much like ***bread and jam*** or ***magnets*** (**FORCE ATTRACTION**, **CONTACT**, **SURFACE**). Before actually moving, both partners let their ***forward projections*** meet in the embrace, resulting in a feeling of information flow and connection**.** The step itself (Figure 3) at first requires a slightly increased shift of the leader's compact body weight to signal an intention**.** The shoulders and arms do nothing; the signal comes from his body's centre.

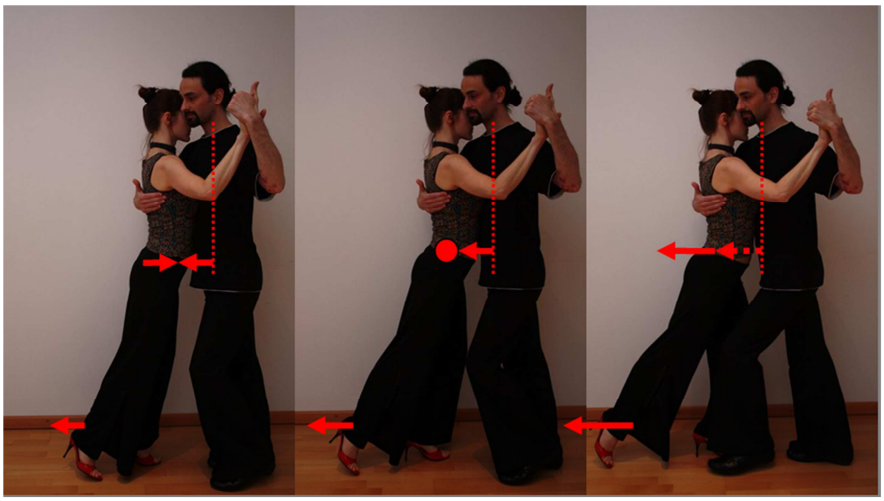

Figure 3: Step sequence forward, from leader's perspective.

Sometimes the leader takes the projection even to the point where he would topple without the partner's slight counterweight.[13] This directed, yet controlled weight transfer is ***caught up*** by and gradually begins to ***inform*** the follower. It is immediately transposed into a backward extension of her free leg, while her torso remains with her partner. Next, the leader's projection increasingly ***loads*** his partner's torso with his weight, while she further extends her leg in preparation. An efficient follower may even slightly ***send*** her torso towards her partner, exaggerating the forward connection. The more she does this, the more her free leg ***belongs to the partner***: i.e. the more control he gets over her weight. Finally, a step ensues in which the two connected body units move as one. The leader's shifting centre of gravity provides the energy to set the follower's torso into motion. Approximately mid step, she actively begins to move, sliding her extended leg to its new position and so changing the relative proportions of the couple's ***engine***. The leader suddenly feels less resistance, although it is still his energy that directs the motion. The final result is a connected motion of both centres of gravity: the hallmark of joint walking (**LINK**, **EQUIDISTANCE**, **SYNCHRONY**). A background condition for this is

[13] Note that the earlier mentioned alternative walking technique of pushing – instead of controlled falling as here – makes the motion energy more independent from the partner: indeed, it lets both dancers maintain their individual axes at all times.

that both partners make themselves an integrated unit (**SOLID OBJECT**), enabling them to feel and control its weight minutely. (See the discussion on core tension: pages 92-93.) This ensures that each step goes through a measured sequence that can be stopped or reversed at any time because the joint system maintains **FORCE BALANCE** at almost every moment.

When the leader walks backwards along a line – the second basic scenario – movement begins from a contact embrace with perfect mutual support: both partners send a kilogram or two of their weight towards the other. As the leader moves backward, the counterweight he provides diminishes so that an ***inviting*** space opens, thereby ***exerting a pull*** that ***sucks*** the follower ***into a vacuum*** (**PULL FORCE**). Her pre-mobilized weight is set free and comes forward with full force. (Technically, the leader's vacuum is created by a very small movement of rolling over the heels, almost like ***sitting down***.) When the movement ends, the initial contact is resumed (**FORCE BALANCE**).

With these highly technical considerations in hand, I now turn to the 'good tricks' that benefit smooth interaction across various tango tasks.

Attentional marking

Leaders and followers alike benefit from *attentional marking* (**PROFILING**): a process of picking out functionally relevant features from the perceptual flow. I wish to look at the marking of body zones as points of orientation. A mover who marks his own centre of gravity is given an attentional focus for controlling weight shifts effectively and reducing his body to its essence. Concentrating on the centre of gravity is made possible by a proprioceptively felt 3-D **FORCE EQUILIBRIUM** and benefits from muscular core tension. This marking generates good motion habits: e.g., by letting all **FORCE VECTORS** begin *there* (***having a string attached to the belly***). Conversely, learning to perceive one's partner's centre of gravity allows one to perceive or control the partner's body as an integrated unit.

Attentional marking is a basic process on which more complex processes build. Examples include approximating goals and correlating marked points in one's own body with those in an observed body: e.g., when the teacher demonstrates something. An especially important marking-based function is *relational anchoring*: actively moving one marked point in relation to another, used as a landmark (*cf.* Langacker 1987). When one moves with a partner, this often requires deciding 'am I the anchor point or moving relative to it?' A frequent mistake I used to make as a leader was taking my follower's current position as a reference point for my own action, perhaps bending forwards and losing my axis rather than actively bringing her where needed – without ***giving up on myself***. I should have made myself the anchor point, not my partner. A similar issue of relational anchoring arises when circling one's partner. It needs to be clear – at any given point – ***who is in orbit***, especially because this may change even within a tango element.

Super-individual imagery of enabling states

Other relational imagery helps create dynamic stability in the couple. Departure from optimally enabling configurations warns against contact loss in any ongoing dynamic. Experienced dancers correct immediately when ***a gap opens in the embrace*** at the shoulder blade (**CONTACT**, **NEAR-FAR**); when their arms feel as though they are ***transmitting no energy*** any more (**FORCE**, **CONDUIT**); or when one partner begins to ***move on a tangent*** to his partner's rotational **CIRCLE**. Notably, keeping one's attention on one's partner's breastbone creates an unbroken alignment. Attraction-vector imagery helps partners stay tuned to each other, as expressed in the metaphor that ***a torch emerges from the breastbone towards the partner*** (**FORCE ATTRACTION**, **SOURCE-PATH-GOAL**). So long as the breastbones remain ***magnetically drawn*** towards each other (or ***connected through a rubber column / elastic band***), any interaction benefits. Circling one's partner becomes easier, even when the two body fronts are no longer exactly opposite. Both partners can use this image in a large number of situations; both can actively correct deviations from it.

Partners in positions with more extreme relative vector angles can picture themselves connecting via their orientation to a ***joint centre*** in the intervening space, which their breastbone vectors cross. For instructional purposes, my teachers sometimes 'extend' their bodies into space by folding their hands before their chests, as in an Indian greeting, their outer hand edges touching to mark the point of intersection. The physical efficacy of the image creates a force parallelogram that transmits signals optimally through the embrace.

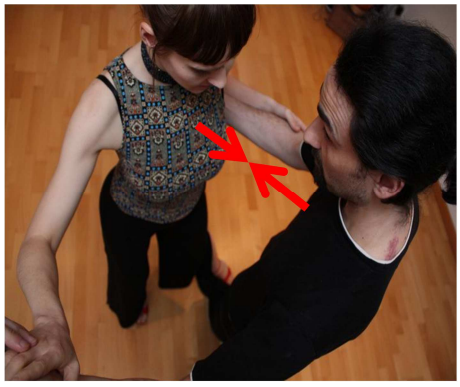

Figure 4: Breastbone magnet/torch/elastic band.

Followers in particular benefit from a more specific technique than mere torso alignment: they engage in minor modulations of their axis, subtly balancing on the balls of their feet within an imagined ***cone*** (Turner 2006), so that their compact body weight is sent towards the centre of their partner's body or towards the body side where the ***contact has moved.*** This ensures perfect transmission of energy and optimal, mutual stabilization. A precise **FORCE VECTOR** emerges from the body front **PLANE**; this requires an ability to sense the direction in which vectors are pointing in a force parallelogram. Experts can feel even very slight deviations. Furthermore, followers make sure to keep their hipbones in opposition to their partner's whenever possible (**PARALLEL PLANES**). When circulating their partner, they align their hips with the circumference of the circle on which they are

moving (**CIRCLE SEGMENT**). Both these skills require marking-point arrays: one's own hips relative to one's partner's hips or to her central axis.

Such regulative imagery establishes 'good states' in the couple and stabilizes the dance. Dancers who have mastered it feel a pull towards the optimal enabling state whenever there is the slightest deviation. As with *habitus*, one can link such functional imagery to dynamic systems theory. At first blush, the vectorial attraction of the imagery might suggest the dynamic systems concept of *attractor*. However, attractors generally refer to system states that are reached repeatedly over a time series; this imagery is rather more permanent: more like a generally enabling *order parameter*. Unlike the order parameters described for *habitus*, these operate not on the level of the individual but the dyad. Naturally, images on the two levels interact: e.g., in *giros* where one circles one's partner, the dyadic breastbone vector temporarily forces the follower to overrule her individual hip-shoulder alignment via a ***dissociation*** technique. A question for future investigation is precisely how the order parameters on different levels of the system interact across different typical tango situations.

Super-individual imagery for monitoring the whole system

My teachers use complex imagery techniques to monitor the current state of contact: e.g., visualizing an ***energy ball*** between leader and follower that reveals the status of shared energy (**BALANCE**, **CENTRE**, **PATH**, **AXIS**; see Figure 5). When weight and contact configuration change, the leader feels this 'ball' move.[14] This regulative image is projected into the spatial void and serves as an imaginary *cognitive artefact* – much as in Hutchins' (1995) account of Polynesian navigation, in which imaginary islands on the horizon provide a fixation point. The energy ball is far more than a simple projection. It enables my teacher to feel the current state of the dyad in real time as it arises from the combined energy levels and relative positions of the partners. It visualizes the emergent properties of a host of sensory signals: a heuristic that greatly reduces the cognitive complexity of the task at hand (Gigerenzer 2007). Good heuristics pack together a lot into one image that is felt and manipulated as a unity. To achieve this, multi-sensory inputs must be channelled into a simple gestalt to reduce complexity. The challenge pays off. Once learners are capable of integrated sensing in all dimensions, complex situations can be handled via a single focal item: yet another **FIGURE-GROUND** process.

[14] A related image, more anchored in the body, that helps the leader actively control transitions is that of a ***juggler passing a ball between her hands***.

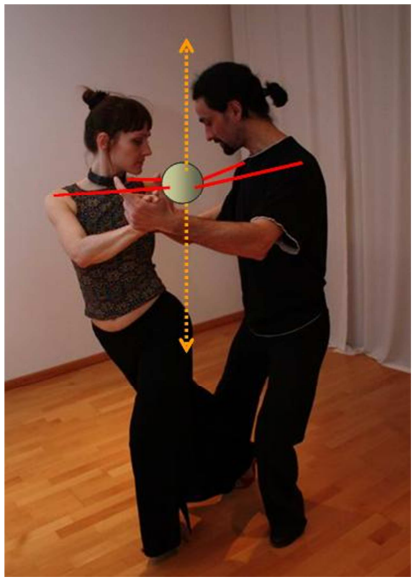

Figure 5: The energy ball.

THE MICRO-PHENOMENOLOGY OF IMPROVISATION

The reader might conclude that, all along, I have been describing *internal* representations; and that, in consequence, smooth interaction emerges through both partners (a) sticking to general principles of postural receptivity and tango 'grammar' while (b) employing imagery tricks to maintain attention, sequence motions, and gauge the current situation, (c) using task-specific action representations: e.g., that of joint walking. While all this serves as a starting point, it underspecifies a fully enactive view (Thompson 2007, Fuchs & DeJaegher 2009). Apart from hints in my energy ball example, I have not yet dealt with the coupling of the dance partners in loops of continuous reciprocal causation. After all, tango is an incremental, dialogic creation of action flow. Even small motion elements should unfold with continuous attention to one's partner's feedforward or feedback signals, in a well-sequenced way. Static representations on their own cannot explain how dancers initiate the dance, shape it, or fix the problems they encounter. One needs to look at the micro-dynamics of the interaction and examine the extraordinarily rich knowledge that dancers possess of what, where, when, and how to sense (see Table 1). *Affordance theory* can supply the necessary dynamic perspective.

Dynamic sensing for affordances

Ecological psychology emphasizes that perception is for action (Marsh *et al*. 2006). Agents actively seek out *affordances*, which are perceived action possibilities, in the environment, relative to the agents' abilities (Gibson 1979, Gaver 1991, Turvey 1992, Stoffregen 2003, Chemero 2009). The converse is also often true: i.e., action is for perception (Noë 2004), so that movement-produced information – e.g., optic flow – signals affordances. Specific perceptual invariants are picked up and guide the next action. The same principles clearly apply to bodily co-regulation, although affordance theorists typically give short shrift to three of its most important aspects: (a) multi-agent interactions,

(b) evolving multi-stage sequences with a complex internal causality, and (c) nested time-scales of action control. I intend to 'refurbish' affordance theory to deal with these aspects.[15]

Tango dancers recognize and respond actively to affordances provided by their partner's body: one person provides percepts for the other to act on, and *vice versa*, in causally interacting loops. The leader's signals provide affordances for the follower, who responds with affordances for the leader. Further affordances can inhere in the pair configuration itself, suggesting opportunities for a figure or providing an open space into which one might step. Often one must choose among several affordances. As the name implies, an affordance is not some narrow constraint but an enabling *option*. Dancers actively produce the affordances they need: i.e., they manipulate a parameter to generate affordances two steps ahead, or else they simply exploit the affordances already on offer. Besides percepts of the partner or space, all this equally applies to proprioceptive sensations, such as muscular or balance-related preparedness signalling one's own action readiness (*cf*. Gibson 1979: 140*ff*.).

Affordances are perceived gestalts that enable action. How affordances tie in with imagery and image schemas should be self-evident: complex image schemas, supplemented, as we shall see later, by 'saturated' multi-sensory imagery, supply affordances. In every situation particular geometric or kinetic configurations signal the 'doable' at hand. So the leader's affordance to begin the back *ocho* ('eight') figure arises from feeling that his partner is on the opposite leg to his own: a feeling of a **CIRCULAR** rather than planar **FORCE** vector that his partner's body follows when mobilized. Most tango affordances are like this: their recognizable image-schematic structure is understood as enabling a specific action. I wish to propose combining a description of affordance-creating and -denying gestalts with a sequential analysis of the invitation-response pattern between the two partners.

Dancers actively – even strategically – sense for affordances. The follower seeks out (i.e., 'senses for') the leader's signals, while the leader senses for possibilities to initiate one or another action in the interplay between self, follower, and environment. Take the simplest situation imaginable: two dancers stand opposite each other, waiting to start. First, the partners negotiate contact and establish bodily rapport. Leaders acquaint themselves with their followers, often adjusting their posture or firmness to the partner's style, height, or suppleness. They actively probe for reactions. Breathing together can establish basic rapport, so some leaders rhythmically emulate the follower's breathing before beginning (*cf*. DeJaegher 2006). As discussed earlier, the correct contact tension in the embrace is non-verbally negotiated. Further feedback is enabled with contact points that both partners find agreeable: e.g., the man's right hand interfacing the woman's ribcage or shoulder blade with the right amount of force. Both partners might ask themselves 'is my weight directed straight towards my partner?', 'do our arms touch at the right points?', 'are my hips below my shoulders?', or 'is my torso upright?'

Before any step can begin, both partners must be aware which leg the partner stands on. The leader does not give the 'go' signal before he knows the follower's position: especially that she is on

[15] See (Kimmel 2012) for a general account of affordance theory with application to other interaction disciplines.

the required leg.[16] In case of doubt, he can explore her position via the hand he has on her shoulder blade – or by almost imperceptible movements such as swaying or rocking softly, varying relative positions, or minutely changing the weight distribution. Such micro-movements provide immediate, instructive feedback. Accomplished leaders can interpret even slight oblique forces on the embracing arm as informing them about the partner's entire body, via the muscle chains discussed earlier.

Another common sensing routine is for the leader to probe the precision of the follower's axis by pivoting her slightly, while her embrace glides along his torso like a ***sliding door***. Miniature pivots only provide a rounded or smooth feeling when the torso is upright and well placed over the supporting leg. The axis should not wobble. This is the clear muscular ***column*** from hip joint to shoulder discussed earlier. Even slight deviations obstruct the feeling of a proper pivot. The leader's strategic sensing and micro-movements solicit feedback that either results in a 'go' signal or the realization that something must be changed

A leader can also employ strategies to amplify his signals by making his own inner body configuration more precise. He can clarify where the contact is moving by concentrating his ***weight projection*** towards the partner on one side. He can establish a clear axis over his hip and pull the partner along or, by making his supporting leg's side longer, help her to sense where his axis is now. He can direct his weight in a more precise line, tighten the embrace, or adjust his contact points.

What of the follower's contribution? Little is needed beyond proper posture and a pleasant but active embrace. A good leader actively seeks out his follower's affordances, inviting or initiating corrections where needed. When the follower feels that the leader is hesitant, she can check her axis or her muscular receptivity in embrace. She can employ attentional strategies like the ***torch*** metaphor to align her torso with the leader's in the proper relative geometry. As the tango teacher Castro (2004) explains, following can be highly pro-active without needing to be explicitly active. The follower *does* actively and strategically sense her partner, albeit with a more responsive attitude. Tuning in to a leader's small, exploratory impulses can be right in some cases; in other cases, a certain amount of resistance is essential to give him a feeling of control and a sense of possible options. An experienced follower dancing with an inexperienced leader might exaggerate her signals slightly or just remain calm and move quite precisely.

To summarize our contact taking scenario, the leader initiates active-sensing micro-movements to gauge his partner's state and seek a starting affordance. Both roles may also initiate *preparatory actions* to correct for any absent starting affordance by repositioning the body; and leaders may nudge their followers to a workable configuration. Especially when working with beginners, several small cycles of corrections allow for progressively larger, more confident movements. The establishment of the *primary enabling affordances*, such as correct contact points, distance, and body configuration, is vital to creating a fully functional joint action unit with effective feedback and feedforward channels

[16] Whenever a leader misapprehends his partner's supporting leg, momentary chaos ensues. Tango has two – fundamentally different – relative weight distribution patterns: the parallel and crossed systems. Their possible movements are not the same, making it imperative to know which system one is in relative to one's partner.

(see Page 98). Both partners must constantly monitor these affordances, check if they are optimal, and make any necessary adjustments.

Having discussed *sensing-for-action*, I next wish to investigate what happens when the first step is initiated: *sensing-in-action*. I begin with a general inventory of typical strategies. The leader leads (*action feedforward*) while actively seeking sensory confirmation (*active monitoring*) that the movement in progress is proceeding as planned. Once the partner has reacted, often no more is needed than *active accompanying* through supportive micro-movements, although *corrective action* underway may also be required. The follower, too, provides action feedforward when invited to do so, monitors the ongoing action for smoothness and ease, and applies any necessary correctives such as adapting the embrace. In addition, followers cultivate special *skills for real-time sensing* and *reactivity* that leaders typically do not train as much, because they anticipate the next moment. Seasoned followers also recognize the importance of *skills for being sensed*. Realizing what a leader needs to feel secure about his lead, they ensure through proper contact, precise motion, and active muscle chains that he knows exactly what they are doing. In this respect followers, with time, learn to emulate what leaders specialize in from the outset: i.e. to check actively whether the partner receives their signals.

Affordance cascades and alternatives

Recall Table 1: it is of empirical interest to elicit and chart action alternatives systematically. Doing so with a sufficient number of people provides insights into the constraints of the discipline (*cf.* Magerko *et al.* 2009). What results is an inventory of the ways in which alternative actions can play out, which Figure 6 illustrates for tango abstractly and in a somewhat simplified manner.

As soon as he has found the desired starting position, the leader perceives a number of available affordances, chooses among them, and initiates an action that signals an invitation – which may set things off in any of several directions. Ideally, the partner perceives the invitation, reacts as intended, and arrives with the leader at the goal. The cycle complete, the leader gives the next 'go' signal in the cascade. The interaction goes directly from sensing to enacting; the leader simply accompanies the follower's response and proceeds. If, however, the follower's reaction is hesitant, the leader can employ a number of on-the-fly strategies of active modulation to help (e.g. signal amplification); and if her reaction is decisive, but not as intended, he can correct her movement under way, but only within bounds without endangering her stability.[17] If her first movement already starts out badly, he may choose to return to 'home base' and start over (which is more difficult in the middle of a dance). Meanwhile, when the follower moves towards an unexpected, but recognizable position, a 'smart' leader will simply take up this new affordance serendipitously and go on. In the worst case scenario, a short breakdown of communication results, because the follower responds in a way that the leader cannot fit in, thus making verbal feedback or a communication 'reboot' necessary.

[17] That this can happen shows that affordances of an objectively spatial and kinetic kind alone are insufficient for understanding tango interaction. After all, the follower is invited, not pushed around.

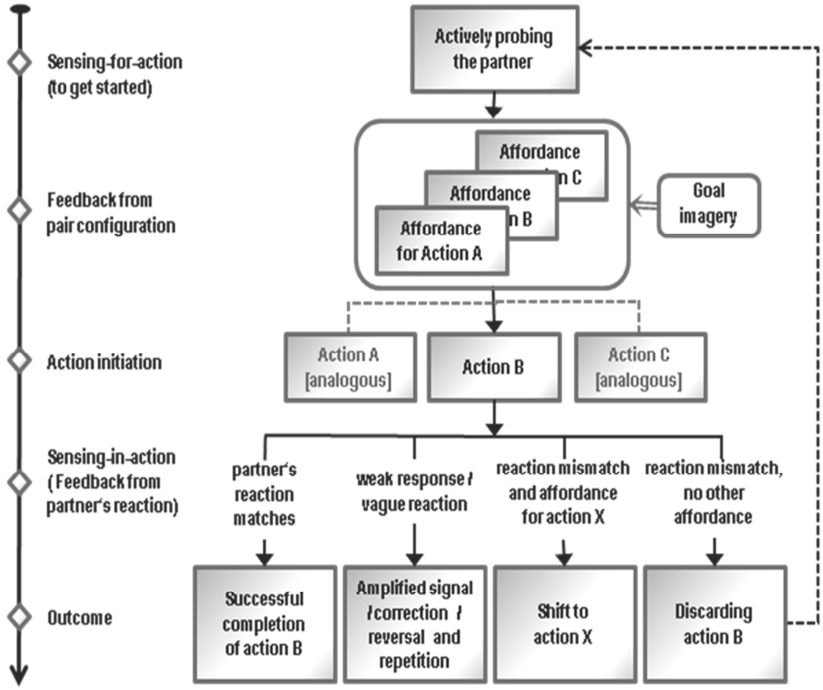

Figure 6: A cascade of alternatives.

Of course, leaders may equally cause irritations or breakdown. An inexperienced leader may falsely interpret his partner's feedback as a readiness signal and begin too decisively; his lead may lack clarity and produce a hesitant or otherwise unintended reaction; or he may fail to sense problems under way, perceiving a continuation affordance where there is none. A leader with moderate action but good sensing skills may curb or modulate his own movement if he realizes that safe continuation is at risk due to excessive energy, lack of balance, or whatever.

More generally, experienced leaders and followers both perceive a constant flow of affordances, which unfolds according to certain laws. Although affordances are seldom absent, their perceived goodness will vary; their seeming density may wax and wane; they are actively created in shifting proportions. As a leader, one may actively sense for new possibilities or just use familiar ones. One may generate options actively even for the next micro-cycle or just go with the momentary flow, confirming or modulating choices that are already underway. Finally, the number and nature of affordances depend on the level of granularity: the time scale under consideration. As I have not been very specific about temporal units so far, this deserves extensive reflection.

Affordance packages and the basic level of affordances

One may usefully distinguish two time scales of affordance perception and enaction, handled in slightly different ways: a basic level and a micro level. The basic level consists of motion elements, such as single steps or pivots. Dancers – leaders certainly, followers possibly – treat these as self-contained planning units in which a set of sequentially ordered micro-affordances is anticipated as a whole. I call these *affordance packages.* Take a step back and recall my earlier description of task-

specific action imagery: e.g., of joint walking, which dancers use to guide what they will do next. Action imagery alone does not give them fully continuous control of the couple. When a leader imagines, say, a joint step, he must activate a dependent – if often less conscious – set of images about sensory feedforward and feedback. Experienced leaders anticipate the resulting multi-sensory feedback integrally with the action at a second's time scale or so. So they are familiar with affordances confirming that the action in question is 'on track', coming close to a particular point, or calling for corrective action; and they possess imagery telling them exactly when to expect a particular tactile quality, pull, or resistance. Anticipatory control structure is needed, even when it may later be modified due to overriding sensory feedback. A leader achieves better sensorimotor control by recruiting both tested ways of chunking his micro-actions and reasonable causal-temporal expectations about his partner's micro-affordance feedback. Only pre-packaged imagery allows for the continuous fine-tuning of an unfolding action in a situation in which signals from both partners interlace in a ceaseless loop. Affordance packages add a degree of prospective control to an action unit, as demanded by recent motor-control literature: e.g., Wolpert *et al*. (2003), Pachiere (2006), Wolpert *et al*. (2011).[18] They are a means for multi-stage sensing and action enablement. Mere Gibsonian *direct perception* of affordances would fall short of these exigencies, especially since tango requires precise, yet fluid and rapid action. A final reason for sensorimotor control via affordance packages is the required match with the leader's chosen improvisation unit. As shall be explained later, affordance packages typically extend between the main points at which new decisions are made.

Affordance packages are never fixed; they are defined relative to a dancer's current intentions and mode of interaction. It may even be possible that various alternative affordance packages are held in mind simultaneously. (Followers, in particular, may activate different likely scenarios when the leader begins a familiar move, as they cannot be certain about his plan.) An affordance package's range of projection is typically linked to the current principal action that, having been chosen, is intended to exhaust itself before the next action begins. A leader chooses an action with an idea of its successful execution; the anticipatory imagery guides his motor behaviour (Keller 2008, Rosenbaum 2010). He works incrementally to close the gap between the present context and the goal.[19] Until full closure is achieved – an action cycle completed – no new choices are considered as relevant. Short of obstructing the current plan, the most he can do is slow it down, speed it up, or otherwise modulate its execution. Having reached his goal, the leader experiences one affordance package ending, another opening up.

[18] Wolpert *et al*. (2003: 596) hypothesize that 'the brain simultaneously runs multiple forward models that predict the behaviour of the motor system', while pairing an action controller with each sensory predictor.

[19] Lee's (2006) *Tau* theory of motion regulation attempts to explain how agents continuously gauge the current state of affairs while acting to close the gap to an ideal state by representing and updating, at each moment, the difference between *is* and *ought*.

The micro-level of affordances

By further breaking up the perceptual flow, one can zoom in on the micro-level of what dancers with honed sensing skills experience. While completing a chosen plan, such as a step, several *micro-affordances* present themselves, on the basis of which a dancer confirms, guides, coordinates, or otherwise modulates the completion of the present affordance package. Such micro-structure depends on the type of affordance package. In one type, action and inter-partner feedback are continuous, with no discernible turn taking or any obvious phases. For instance, the leader may continuously shift his axis sideways and simultaneously monitor how well his partner follows the shift. Sensory feedback permanently flows back and forth between partners in small, but essentially similar increments. Alternatively, the flow of micro-affordances may reflect the necessities of sequential ordering and precise timing within an affordance package with changing increments. To encourage a follower to begin a forward step, the leader gradually intensifies his invitation and 'senses for' the split second when she comes close to unleashing the step's energy; then he triggers the step, and lets its energy run its course with only gentle accompanying action. In this type, the later stages are causally contingent on the earlier ones.

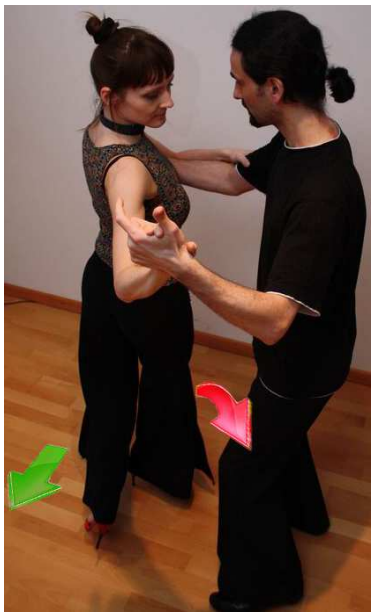

Figure 7: Maximum elasticity point just before the follower's rotation is reversed (red arrow).

Certain tango techniques require *multi-phasic enabling* (or *triggering)* towards a goal: 'I act to let you act to let me act in return…'[20] Allow me to illustrate, using the affordance package of a *boleo*, in

[20] This is partly reminiscent of Gaver (1991), who speaks of *sequential affordances*. Acting on affordances makes new information available, thereby disclosing further affordances to act upon, and so forth. All subsequent affordances disambiguate the prior ones by revealing new aspects about the explored item: e.g., when seeing a door in the wall and then approaching it to feel with one's hand how to operate the knob. Although his focus is on static objects without any notion of actively changing the environment, Gaver captures the fact that exploratory micro-sequences are gradually realized. My common interest with Gaver is the sequential ordering, even though the dynamic nature of tango directs my own focus in a different direction, to

which the follower's leg swings in an exquisitely dynamic come-and-go motion, given the right energy and timing of the lead. The leader first induces a pivot in the follower and invites a leg extension (as in leading a backward step, but at an angle). He then waits a split second, highly attentive to the precise moment when he senses an elastic tension in his partner's shoulder blade: an indication that her torso and hips are maximally 'dissociated'. This is when he sharply reverses her torso into a countermotion that sends the still extending leg flying upwards through its moment of inertia. The timing of the reversal is contingent on sensing the 'maximum elasticity point' micro-affordance. It is all important, and leaders often struggle to hone their senses to this subtle trigger. A slightly earlier reversal produces a somewhat different effect: a crisply ornamental stop-reversal with closed legs. Done much earlier it would not look like much at all, and reversing too late might make some followers even begin the backward step of an *ocho* or the like.

The example throws several points into sharp relief. First of all, micro-affordance skills are demanding! Dancers must acquire a basic grasp of the multi-phasic structure and learn what percepts make useful triggers before they can even begin to acquire the necessary sense of timing. Second, the leader must produce his signals not only in a particular order, but also at the right moments, directing focal attention to the relevant body locus and seeking out the relevant micro-affordances that tell him to trigger his partner's next micro-action. Active sensing never ceases but constantly shifts focus. This sequential ordering of actions and micro-actions evolves 'dialogically' as question and answer: so a leader's shoulder opening triggers his follower's subsequent step, landing her in axis and confirming the movement's completion. In continuous cycle, the leader initiates micro-action after micro-action, each time waiting for feedback to proceed to the next. A moment's pause may be a deliberate expression of 'it is your turn now'. What observers perceive as seamless action flow is, to the dancers, a carefully orchestrated series of signalling and turn taking.[21] Third, generic tango knowledge may assist in ordering micro-affordances, notably sequencing rules such as 'complete pivot fully, only then extend leg'. Finally, my *boleo* example demonstrates that the nature and duration of an affordance package cannot be determined externally but depends on the leader's *situated intentions*. A leader intending a *boleo* while anticipating the particular micro-affordance of elasticity might, on other occasions, anticipate the earlier micro-affordance to initiate a crisp reversal instead, or allow the

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focal sensing for specific triggers that are already expected to occur at a particular point in time, rather than being aspectually explored by and by.

[21] This sounds paradoxical, but it is possible because not all moving body parts have communication value for the partner. The leader may frequently move his legs without transmitting an impulse to the embrace. His leg action may continue while the lead pauses: for instance, to give the follower time to complete a step or simply leave her poised for effect. What is more, one frequently sees the embrace change between more flexible and more directive phases. Leaders learn to loosen the embrace strategically, so as to take communication value out of it for a brief moment before re-connecting and producing a lead-relevant signal again. Even the usual mirror-like physical connection of the axes can be suspended for certain elements. This amplifies my general point about prospective action control, as both partners have to learn when to connect, how much, in particular techniques, and which body parts to use.

partner to continue her backward step in a move with far less critical timing and a more continuous package structure.[22]

Recall, again, that the beginning of a dance depends on establishing simple *primary enabling affordances*. I have not yet mentioned something related, but more complex: during an ongoing dance, what the leader does towards the end of one affordance package often serves as specific preparation for the next, such that affordance packages may overlap in time. Say that I am executing an *ocho* ('eight') figure. I might be just about to bring my partner into position for a pivot through an axis shift to the left, even as my right shoulder opening is already signalling the next package: a movement to the right. For this to work, I must pay attention to the micro-affordances for completing the current package; otherwise they may disappear too soon, due to e.g. an exaggerated counter-movement. In extreme cases, different body parts may independently exploit different affordance packages at the same time, creating highly complex micro-coordinated patterns and complicating the already intricate task of turn taking. A separate paper would be needed to address this in detail.

Leader knowledge: Node point configurations

To be able to create a longer improvised dance, tango leaders need to map all of this onto further cognitive skills. They structure the dance by drawing on their repertory. Most of the time, they guide the dyad through a series of familiar pair configurations that present intermediate goals and re-routing points, but can also be exploited *ad hoc*. In more technical terms, experts represent complex action sequences using what Schack (2004) calls *node points*, which he investigates in the context of volleyball spikes, ski jumps, and ballet.[23] The present, improvisation-based context gives node points a special twist, allowing them to be chained on the fly in variable order. They specify those positions on the present trajectory that are suitable for switching to a new trajectory one has in mind. As such, they constitute possible bifurcation points. Mastering them is one of the main challenges in learning to take the leading role in tango. Node points presuppose the general skill of parsing the motion flow into snapshot-like *sequencing points*, yet not nearly all of these qualify as nodes.

Node points comprise the main junctures of the dance. Leaders seek out basic configurations before initiating a new sequence, return to them when unexpected problems occur, and playfully shift between them in ways reminiscent of the jazz pianist Sudnow's (1978: 120-122) talk of safe 'stances'

[22] Note also that, even though most leaders stick to their intention and execute *boleos* as an integral unit – sometimes, for better or worse, because everything happens so fast – top-level dancers might change their intention part way through without breaking the flow. Spontaneous switching to another affordance package before the present one is completed may actually be quite frequent in other techniques. Future research needs to show if there is a clear way to determine how far ahead anticipation reaches, whether motor preparation and sensory feedback expectations are really always chunked similarly, and whether Plan-B anticipations occur. One also needs to study whether followers really only perceive the 'untainted' flow of micro-affordances or create chunks themselves, albeit more tentative ones.

[23] In Schack (2010) and Bläsing (2010) *basic action concepts* is the preferred notion. In any case, there is a slight difference: I am referring to a configurational state *between* two actions that serves as a point to connect them, rather than the action itself. While what Schack' means by nodes is also important to the present context, they are called *sequencing points* here.

and 'springboards' for action. Various configurations – opposing stance with mirrored feet, opposing stance with diagonal feet, leg cross, V-position, T-position, and many others – create a veritable matrix of flexibly recruited reference points. Nodes represent pair configurations known to afford the beginning of a new action unit, usually presenting several alternatives. In perceiving the node [*T-position between partners, both with closed legs]* I know that it affords doing a *sacada* (invasion) into the partner's space, provided I lead her into a straight step and step into it; but I also know that it affords letting her invade my space, provided I pivot both of us 90 degrees first, make a step, and let step into my trajectory. The number and granularity of available nodes depends on a dancer's abilities and accumulates with experience. Top-level leaders recognize several node points within a single step cycle; fairly experienced leaders recognize one; and still others may have to complete several steps before being able to make the transition to the new element they have in mind.

Nodes refer to situation-specific knowledge of usable transition points from a current trajectory X to a desired trajectory Y (respectively, Y_1, Y_2, Y_3,…). Often, alternative nodes for different techniques may be only centimetres apart on the ongoing trajectory, so a capable leader must be able to distinguish their visual and other sensory characteristics. *Qua* imagery, every node is a mental snapshot that combines aspects of relative configuration (contact points, weight distribution, distance, and vectorial configuration between partners) with aspects of body form, such as dissociated chest and hips. Imagine I am leading a series of forward steps and decide to switch to an *enganchada* (a leg cross initiated from behind), either for its own sake or as a transition to another tango element. In planning the *enganchada*, I will concentrate my attention on the point halfway through one of my partner's steps, anticipating the right moment to reverse her direction with a small circular motion that brings her into the cross. If I am sufficiently experienced, I might decide this only a split second before acting, just long enough to prepare the motor system. Depending on the depth of planning, node goals can be deliberately steered towards (*guided mode*) or simply detected and chosen on the fly (*opportunistic exploitation*).

Much phenomenological evidence corroborates nodes, which tend to have a special vividness in memory. To dancers, they connect with a unique bundle of options for continuation; they mark the best points to change or adapt a plan or spontaneously try out something new. Nodes also provide opportunities for deliberate pauses and constitute 'home bases' (*cf*. Eilam & Golani 1989) to which to return under duress. Assman *et al.* (2007), who investigated infant motion patterns, dub the underlying principle *postural coding* of 'a set of stored postures that is used for the direction of movements' (2007: 583). When dancers verbally explicate their planning of transitional pathways – given that distant nodes can only be reached via intermediate ones – they commonly do so referring to nodes. Furthermore, functional observation and scene-parsing skills are largely node based: e.g., picking out technical elements from the visual flux of rapidly moving dancers in a video (*cf*. Calvo-Merino *et al*. 2005). Watching teachers' demonstrations of complex sequences, tango students struggle to identify recognizable points to hook onto – short cuts to key moments – which they can use later for focused

practice. Nodes can serve many creative purposes for the tango dancer, who uses them to re-arrange dance elements or find new ways to connect them. I remember a particular teacher once demonstrating three elements before encouraging his class to arrange them in varying ways. *Node extraction* can help followers reflect on what is happening to them and re-orient both leaders and followers whose attention has slipped for a moment; they aim to detect similarities to node gestalts.

Nodes are often felt to exert a pull towards their actualization. Leaders consciously experience this pull when their partner reacts in unexpected ways. Suppose I intend to lead my partner into the starting position for a forward *ocho*. For whatever reason, my partner produces a slightly larger axis shift than I intended, moving into the starting position for a backward *ocho* instead. At this point, I experience the pull towards the backward *ocho* as the stronger one. When a partner does something unexpected like this, enforcing the earlier plan would disrupt the kinetic flow and also take time. Feeling the pull of the new goal state is so natural and incurs such a low 'correction' cost that the follower might not even recognize that a misunderstanding occurred. Choosing the nearest 'attractor' is always a good improvisational option: a notion I freely borrow from dynamic systems theory. Attractors, of course, are energy-optimal points of the so-called *state space* to which the system tends to move, whenever one is located in their vicinity. Phenomenologically speaking, reaching an attractor goes with a feeling of ease, of functionality, of something that 'clicks'.

Connecting nodes

Tango leaders constantly find themselves in states where a gap to a node point still needs to be closed. Somehow the pair configuration must dynamically morph to the goal state: e.g., from half closed to fully closed legs. The gap may be closed in one of two ways. Leaders with prior experience of a specific 'move' may draw on stored *connective pathways* from the start to the goal node: i.e., two static snapshot images with a dynamic gestalt that connects them. This is often stored in memory through multiple key frames of the type I call *sequencing points*. Otherwise, the pathway can be *soft assembled* in real time (*cf*. the path-interpolation algorithms between key frames described by Rosenbaum 2010). Soft assembly recruits multiple independent components for a motor task in order to flexibly adapt to a unique situation (Thelen & Smith 1994: 60). Leaders find a solution guided by a strong set of constraints but with some initial degrees of freedom, which are narrowed down as the leader incorporates micro-affordance feedback and negotiates the details of his chosen path.

Both ways of connecting nodes benefit from the leader's earlier drilling of basic single-body 'morphemes' such as *inner rotation, outer rotation, steps in any of the four cardinal directions, weight projection, axis shift into a cross, shoulder opening,* and *upper-body dissociation.* In my own apprenticeship, I began building pathways with greater confidence as soon as my teachers taught me to experiment with the basic morphemes and try them out across many contexts.

Improvising with non-enforced scripts

Again: improvisational trajectories are built around a repertory of *node points* that connect tango elements in varying orders and provide a 'home base' when e.g. the interaction stalls. This completely free mode of improvisation with minimal planning depth, however, does not exhaust the possibilities of co-regulation. Leaders frequently operate in a more guided mode and plan ahead somewhere between three and ten steps, all the while keeping re-routeing points in mind where action alternatives could branch off, especially in case some unexpected event requires them. I call such contingency plans *non-enforced scripts*. Say I might want to lead a circular figure consisting of seven steps. I expect to be able to follow through with it; but should my partner respond with hesitation or with an unexpected reaction, or should other couples on the dance floor intrude, I should be able to accommodate this without bringing her off-axis or rushing her. If I try to enforce a multi-step script, I run the risk of making the dance less pleasant for my partner or colliding with other couples. In this mode, the script furnishes a provisional action template, whilst the leader incorporates feedback (blockages, alternative affordances) to be prepared for a change of plan or inspiration of the moment. Non-enforced scripting flexibly combines two skills. First, the leader must pay attention to micro-affordances brought about by e.g. hesitations and blockages. Second, the leader must activate his knowledge of node points to re-write his script dynamically, should a change of plan be required. He must be able to extract the relevant node points and parse them into appropriate subunits.

The learning curve from fixed to non-enforced scripts is easy to track in tango apprenticeship. Many if not most people start from learned scripts. Over time, they learn to break them into smaller segments as they try a new entry or exit or insert a new element. Scripts can be truncated, interrupted, digressed from, re-connected to, or joined to other scripts at each and every node point. I might just have practiced a familiar multi-step rotation only to stop in the middle this time, to change direction; further along in my training, I might feel confident enough to segue to another figure. Breaking up and re-combining scripts over and over or adding small elements is one way to learn improvisation, as trial and error leads automatically to discovering the node points that work: e.g., one might fit a *gancho* (leg hook) into a *giro* (orbital circulation) by intercepting one's partner's leg. Such inserts remain subordinate to the overall script.[24]

Of course, many novice leaders execute figures as inflexible mini-choreographies, consisting of a fixed chain of elements. Individual elements of *forward step*, *side step*, *pivot*, *invasion*, and so on are all pre-arranged, and re-routing is difficult. In the extreme case, the scripted figure ends up looking like a single huge affordance package – but I hesitate to call it that for two reasons. First, not all such leaders enforce their scripts like mindless robots, oblivious to feedback. They might recognize that a

[24] Script use in the context of improvisation is subject to competing constraints. One must be able to re-direct on the fly, yet one's motor system must have sufficient time to prepare for any change of course to avoid staccato. How can one re-direct fluidly? Sensing warning micro-affordances a split-second ahead helps, so the motor system has time to prepare; a good axis restores balance after each step cycle and stabilizes the joint body; primed muscle antagonists that kick in at once if required add to this: i.e., braking skills.

given continuation is not optimally afforded but simply fail to see alternatives. Second, leaders usually differentiate the elements of any longer holistically remembered figure into motor sub-plans, if only in a rudimentary way. I began my tango apprenticeship with teachers who emphasized scripts and still learned to distinguish some individual elements – even if I reproduced them in a slurred way, without awareness of similarities across figures, and with a non-functional way of parsing the motion flux.

Summing up, leaders employ different modes of intentionality. Some, especially novices, tend towards *enforced scripts*: multi-step choreographies devoid of any real improvisation. More experienced leaders use what I have called *non-enforced scripts*: contingency-based planning that keeps nodes ready if needed. A third alternative equally relies on *node point* knowledge, but with shallower planning that is never more than about one step ahead; each choice draws on affordances detected on the fly. In this case, the leader is fully in the moment, the 'here and now' in which followers always find themselves. Both of the last two alternatives facilitate creativity and opportunistic exploitation of affordances by drawing on a fine-grained knowledge of node points.[25] Node repertoires therefore play a role in both, anticipated rerouting in choices made almost in real time. The more node points a dancer knows, the more versatile and flexible the dance grows.

Wrap up: Various types of imagery and their joint work

Finally, let me clarify the relationship between task-specific action imagery, node point imagery and affordance package imagery, all of which provide knowledge-driven mechanisms and work hand in hand to build a dance trajectory (Figure 8).

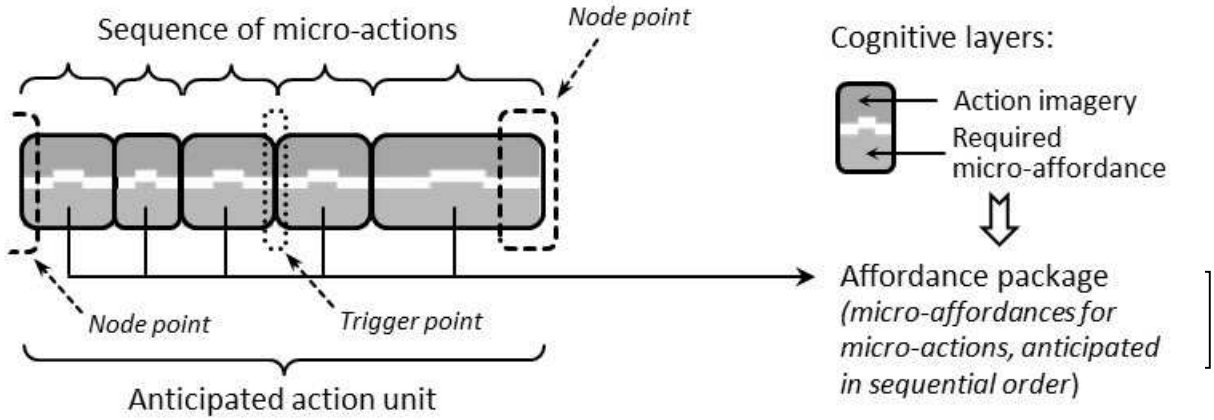

Figure 8: Types of imagery.

Action imagery represents specific tango elements dynamically and is often structured by mental 'snapshots' of key frames (*sequencing points*). Node points are pair configurations known to be usable for transitions to the next unit; they are most often located at the end of the action unit or at any other sequencing point that permits re-routing, if required. Affordance packages are aids for the execution of

[25] One might note a fourth alternative, beyond my present scope: creative exploration of novel motion elements created from motion morphemes and general tango physics, as primarily seen with highly advanced tango experts. It would require a study in its own right.

the action unit, permitting minute co-regulative control via an anticipated flow of micro-affordances. They contain multi-sensory expectations in sequential order and may – but need not – manifest *trigger points*: i.e., sequencing points with added features making them suitable for properly timed multi-phasic enabling within the anticipated action unit.

Overall, as the various imagistic systems interact, the end point of an affordance package is determined by the chosen node when the leader operates in a more guided mode, whereas nodes chosen on the fly may cut off or 'morph' the original package. A protended affordance package can generally be as small as allowed by the dancer's familiarity with nodes *on the trajectory of the current movement*, which can be recruited for stopping or re-routing. It remains for future study to see precisely how this interaction of different types of cognitive mechanisms works.

Methodological insights

What insights can one take away about improvisation in general? Improvisation is characterized by a near absence or by a flexibility of plans. One can describe it as action chaining with at best shallow planning depth, each envisaged element reaching little further into the future than the time needed to prepare for the next micro-action. At the same time, tango improvisers create a dance in a way that is free yet not at all arbitrary. The underlying structure is a precondition of the improvisation, facilitating swift and precise interaction. The essential non-arbitrariness is reflected both in the formal aesthetics of tango and in the cognitive skills it requires: notably the leader's mastery of a node-point repertory that specifies workable transitions between dance elements.

I would expect my tango-based model of improvisation to carry over in major ways to other co-regulation systems such as martial arts with similar characteristics, notably formal rigour and strict pacing. In any case, researchers of any type of sophisticated interaction skill should model the continuous sensory exploration and active multi-stage triggering of micro-affordances, if they wish to understand *their* discipline. In any dyadic interaction, partner feedback must be actively monitored and modulated, so as to maintain contact and enable proper timing. Information flow between partners must be explored in relation to plans large and small, including the relationship between short-term motor preparation and mental scripting that protends further.

My inquiry offers several methodological lessons. It illustrates the value of *micro-genetic analysis* (Fogel *et al*. 2006, Bamberg 2008) to an enactive approach. It shows that any phenomenology of sensory perception has limited value if decoupled from task-specific micro-level routines. Situated perception and action skills, such as sensing for an expected trigger, are critical for proper top-down cognitive functioning, requiring exploration of both *in situ* choices and established repertory. Researchers of task-specific action imagery, in their turn, should explore micro-sensory correlates in conjunction with the former.

I have suggested several specific methodologies:[26]

- Phenomenological micro-analysis of interaction sequences requires the researcher to ask informants about routines that have proven their worth within the discipline, as well as action representations and the affordance packages that go with them. The latter can be analyzed down to the level of their micro-structure: sensing-for-action, monitoring-in-action, action modulation, action accompaniment, multi-phasic enabling, etc. The analysis can be used to model the co-regulatory structure in a particular interaction discipline with respect to the segmentation of action phases and the taking of turns.
- To learn about improvisational skills and constraints, one can ask agents in the 'active' role to specify node points, if one knows their current skill level and preferred action modality (fully improvisational, semi-scripted, scripted). Researchers can start from a given node and have their informants chart the matrix of alternative pathways for continuation, or else start from a given trajectory and have their informants specify all nodes along it, and all new pathways to which they connect.
- Analysis of imagery – often mutually calibrated images – can reveal not only task-specific action representations, but also tap into the constraint sets that practitioners impose to maintain contact and good form. When the analysis moves up to the level of general order parameters, it can reveal the underlying regulatory system, both at an individual and dyadic level.

I have at best but sketched these methods. Future studies are needed to develop an event notation that can better track both partners and their feedforward and feedback information flow. Practitioners of various skill levels need to be observed performing the same tasks. Inventories of nodes need to be developed, for didactic as well as research purposes. The creative abilities of top-level experts need to be addressed: e.g., 'soft-assembled' additions to the system. Nevertheless, I hope that others will share my conviction that micro-phenomenological tools may yet prove the key to understanding the intersection of skilled embodied interaction and expert improvisation.

[26] My approach dovetails with recent trends investigating signal transfer and constraints in unplanned interaction. Hutchins' (1995) cognitive ethnography of teamwork provided the first model for tracking information transfer using a time score, combined with interviews and participant observation. In a micro-ethnographic study, Maduell and Wing (2007) analyzed largely non-verbal cue structures in a flamenco ensemble. They found an *ad hoc* pattern of call and answer. Because the lead often changes, strict rules determine who controls the rhythm. In similar fashion, some signals in tango maintain the *status quo*; others initiate change. In a study of improvisational theater and its constraints (Magerko *et al*. 2009), the authors asked participants to improvise a game until all alternatives were exhausted. Schögler's study of jazz ensembles (1999, 2003; see also Williamson & Davidson 2002) found clear phases of coordination prior to shifts in register; musical excitation alternated with relaxation at increasing levels of synchrony. Finally, in an fMRI study, Berkowitz and Ansari (2008) explored the spontaneity of piano improvisation within constraints on rhythm and melody.

THE TANGO LESSON FOR SOCIAL COGNITION RESEARCH

How does the current debate over social cognition and intersubjectivity stand to gain from this case study? Tango is paradigmatic of a special kind of improvised interaction, involving real-time coupling via body signals, formal constraints, and externally imposed (musical) pacing. Along with *all related practices*, tango calls for a theoretical approach that remains under-represented.

The limits of intersubjectivity research

Consider whether and how dancers infer what the other dancer wants. Responding to the *theory of mind* debate, Gallagher and Hutto (2008) argue that inferring or simulating a person's intentions is *not* essential to interaction: context and the other's body signals suffice to permit successful interaction. Tango radicalizes their point, as its successful practice draws primarily on bodily information. Observation of weight, force, and orientation provides a simpler, safer strategy than any mind reading. Attending to signals directly at hand is the only reliable way to manage highly time-constrained communication.[27] Whenever followers try to infer what their partner wants beyond the present moment, erroneous anticipations ensue, genuinely joint dancing is compromised, and attention is diverted from incoming body signals. Motor resonance between the partners fails (Sebanz *et al*. 2006: 70), and consequently so does action prediction. Whenever a clear invitation is absent, the best strategy is to do little and wait for guidance; otherwise the leader gets confused whether or not his invitations have been received and understood. For followers, any anticipation beyond the next split second – based on e.g. scripted figures they happen to know – needs to be unlearned.

Next consider *mimicry* (Gallese *et al*. 1996, Adolphs 2003) and *affective attunement* (Stern 1985). Although basic-level, embodied empathy is always present, tango requires something more. Tango dancers can neither just mirror nor vicariously re-create their partner's experience. Followers and leaders usually possess different skills. Much of the time they do different things. Those experienced in both roles may be able *partially* to simulate what their partner feels at any given moment and use this knowledge to communicate better. Regardless, the tango dance is far more complex than mirror symmetry can describe. Even entrainment (Condon & Ogston 1966), which is used to explain synchronization of swaying or clapping, applies in only very limited ways. Although the rhythmic constraints of tango music help in placing one's steps at the right moment – to some extent independently of one's partner – the leader's deliberate marking makes any automatism impossible. Meanwhile, studies of sequential information exchange (Sacks *et al.* 1974) misrepresent both the continuity and simultaneity of bodily engagement in tango. Despite its invitation-response structure, tango's information flow remains bi-directional.

[27] Fuchs and DeJaegher (2009: 472) suggest that *theory of mind* faculties are generally reserved for resolving ambiguity. Yet in tango, even ambiguous situations are mastered via body signals.

So what type of co-regulation phenomenon is one dealing with here? Tango represents truly *dyadic* cognition unfolding in closely coupled, embodied interaction. Several key characteristics make such a system different from what the current dominant research paradigms address:

a. Tango skills transcend everyday attunement and simulation skills, even if they draw on them in part. The required tasks make mind reading and action prediction superfluous or even harmful. Tango interaction is fully co-regulative, embodied coupling, requiring an unbroken loop of information exchange and genuinely reciprocal causation.
b. Partners connect continuously. Communication capitalizes on real-time affordances generated by the partner's body, as well as musical and spatial affordances. Improvising requires continuous, experience-driven scanning for affordances and continuous readiness to react to incongruities.
c. Followers need not rely on scripts at all. Leaders may use scripts of one or two seconds' duration but must remain at all times sensitive to their partner's feedback and able to change plan. The planning depth of accomplished leaders often reaches only to the nearest known node point.
d. Tango requires sophisticated cognitive and sensorimotor skills, aided by partly task-specific, partly general imagery. These skills are asymmetrically distributed: leaders have a special knowledge of node points, while followers do not necessarily require it. Their own focus is on being receptive and precise in their movement.

Enactivism, representationalism, and finding the middle ground

Following Fuchs and DeJaegher (2009), I believe that intersubjectivity research needs an enactive approach – especially when studying those phenomena in which intentions are expressed bodily and continuously transformed through interaction. That said – and as Fuchs and DeJaegher themselves point out – an adversarial view of enactivism versus representationalism is unhelpful (*cf*. Markman & Dietrich 2000, Chemero 2009: 67 *ff*.). It is too easy to make a straw man of the representationalist (or internalist or cognitivist). Rather, the role of the enactivist is to remind the representationalist that sometimes a holistic view is needed, and that intrapersonal processes are and must remain critical units of analysis (Marsh *et al*. 2006).[28] My framework addresses representations by asking three questions:

a. Which bodily constraints or affordances do representations generate for oneself, for one's partner, and for the tango ensemble as a whole?
b. How does 'sedimented' knowledge contribute to an agent's situated probing of her partner's body, and which gestalts does she strategically seek out?
c. How are representations distributed among agents, and how are they calibrated for the purposes of the system?

[28] The authors' perspective takes "what is known about the laws that govern solo perception-action systems and uses that as a starting point to conceptualize how joint perception-action systems might be similar" (p. 24)

Research on embodied interaction has largely overlooked the value of experts' representations. For those who find the notion of representation unpalatable, affordances and imagery provide less static formulations: a middle ground. In any case, consideration of expert practitioners' knowledge opens new windows on bodily practices. One can begin by exploring the expert's repertoire of praxeological constraints, action-affording gestalts, and active sensing strategies. One can look at the dynamic deployment of these elements in contexts like joint practicing.

My argument also bears on the issue of *methodological individualism*. Long dominant, this research paradigm has recently come under heavy critique from co-regulation theory. At the same time, while I agree with authors like Fogel (1993) that co-regulation produces an emergent level that must be studied in its own right, one must not discard what *individuals* know. A self-evident yet easily overlooked point emerges from the present study. In tango, representations can be entertained *by* individuals without being mere representations *of* individuals. What is represented, among other things, are aspects of the dyadic process: e.g., in regulative imagery for monitoring the couple as a whole or in pre-activated expectations about sensory feedback from the partner in a given task. These representations are, indeed, processed 'in the heads' of individuals; but their 'input' and 'output' systems extend beyond the individual's skin, into the dyadic system and environment. Representations not only guide action, they respond to feedback from the entire dyad and dynamically update themselves accordingly: e.g., through 'distal sensing' of the partner's foot via a muscle chain running through two bodies. Emergent imagery such as the earlier discussed energy ball in fact takes information about the state of dyadic interaction as its sole representational content. Individual dancers' minds may conjure homunculi of a kind: e.g., when I picture myself in interaction, I do, indeed, picture my body; but never without imagining what my partner does relative to it.

My methodological plea is this: in contexts like tango, the co-regulation process cannot be understood without understanding, as a topic in its own right, the cognitive regulative tools employed by expert practitioners. I see my present study as validating an important new tool for intersubjectivity research – one that addresses a specifically *dyadic* phenomenology.

Micro-phenomenology and the dynamic systems viewpoint

Tango is complex, and it is dynamic. A self-evident affinity exists between the first- and second-person phenomenological approach to co-regulation that I have used and the third-person approach suggested by non-linear dynamic systems theory. In the spirit of Thompson (2007), the present study aims to bridge the gap between these perspectives by investigating the strategies and skills whereby experts 'performatively configure' the dyadic system to make it display the properties they seek. My phenomenologically inspired approach deliberately makes use of concepts from dynamic systems theory, drawing parallels between attractors and pair configurations indicative of node points on the

one hand, between order parameters and *habitus* ('good states') on the other.[29] Theoretical bridge building of this sort helps me explain how data on *subjective* regulative structures complement data on *objective* motor coordination. It is a key guide to discovery to seek counterpart connections between these viewpoints. I am pursuing these ideas in an ongoing study, triangulating motion-tracking data from six tango couples with subjective reports.

In short, there is nothing wrong with saying – from an observer's viewpoint – that tango is a self-organizing system in which initial conditions plus external constraints generate an emergent, dyadic, macroscopic pattern. At the same time, one must not neglect the more 'internal' examination of the task-specific intentions and interdependent representational skills of the two individuals that shape and mediate this pattern.

Gestalt theory, extended cognition, and enactive cognition

Last but not least, my study advances image schema theory and other variants of gestalt theory. Symptomatically, previous research on image schemas – which I have drawn upon as conceptual primitives for the compositional analysis of some of my data – routinely describes them as dynamic entities, but specifies only vaguely how they support the dynamic action sequences of individuals, never mind dyads. Several empirical insights about tango take one beyond this level.

As multi-phasic tango interactions unfold, there is a continuously morphing gestalt flow, which one can capture through detailed analysis of multi-modal action imagery. My analysis is dynamic in a stronger sense: much of gestalt cognition is responsive to momentary changes in the environment, such that each micro-situation creates fresh affordances for the agents to pick from. This dynamicity is all but arbitrary. A set of further gestalt representations provide both the necessary orientation points and the constraint sets that enable improvisation in the first place.

I have hopefully made clear that one needs to extend the analysis of dynamic gestalts across various levels of the highly complex system under study, from autonomous routines to genuinely superindividual ones. Tango imagery begins with individual posture, balance, and deployment of energy; it continues with contact zones, relative positioning, attentional focus, energy-channelling muscular chains, and joint weight transfer; and at the top-most level, imagery lends dynamic stability to the dyad: e.g., through vectors between the two breastbones that create a 'communication centre'. Tango gestalts clearly reach out beyond individual motion regulation. The embrace creates a 'supersized' agent (Clark 2008): an extended body schema that receives feedback 'from beyond the skin'. In the embrace, one feels the body of one's partner *directly*: e.g., 'does her left foot already touch the floor?' The leader can actively use this knowledge to determine what the dyad can do next (*cf.* what Fuchs & DeJaegher 2009: 472 call *mutual incorporation*).

[29] Had I focused on tango apprenticeship, I might have made reference *phase shifts* (Thelen & Smith 1994: Ch. 4) that come about as tango concepts and imagery are appropriated step-wise over months, leading to sudden bursts upward on the learning trajectory.

I have shown how one type of imagery – image schemas – creates action trajectories, provides both single-body and dyadic order parameters of various sorts, and co-defines node points. At the same time, I have exploited the natural fit with affordance theory to shape a truly enactive gestalt paradigm. Such an approach needs to model how action representations are saturated with temporally granular multi-sensory imagery that assists the co-regulative fine tuning of short action units, notably via anticipated affordance packages. All these types of imagery are complementary and mutually constrain situated co-regulation. Something novel results from this way of looking at things: a full-blown paradigm of *imagery for interaction.* The future potential of a gestalt-based approach to performance-oriented research is hard to over-emphasize. It captures skills in a natural, close-to-experience way, with regard both to situated tasks and general constraints.

CONCLUSION

This paper draws attention to a scarcely studied topic in social-cognition research: elaborate, culturally shaped co-regulation skills as are found in dance, martial arts, sports, healing practice, horseback riding, and so on. These skills and their consequent practice add a complex realm of interaction expertise to the basic skills everyone acquires as children. Expert-level co-regulation skills take years to learn. Owing to their complexity, they provide a test bed for a mature social-cognition paradigm and an opportunity to explore much of what usually remains implicit in human interaction.

Thankfully, a modern generation of tango teachers considers dynamic contact a teachable skill. These teachers use introspection to put their dance imagery into words. Their approach helped me realize just how much bodily skills *are* cognitively penetrable and inspired my diary-based and dialogic interview methods for exploring ‘what bodies know’.

From this starting point, I have demonstrated how the ability to improvise in tango is rooted in a multi-layered matrix of dynamic gestalts. These provide both partners with multiple opportunities – but also with the constraints that make communication possible in the first place. In a complementary way, I have explored tango’s dynamic micro-patterns: in particular, the finely honed routines of active *sensing-for-action* and *sensing-in-action*. In analyzing them, I have adapted the affordance framework, explicitly connected it to action representations and prospective control, discussed relevant time scales, and related all of this to the background of node points and connectives that all accomplished leaders use. Perhaps my take-home message can be condensed into a single – if paradoxical sounding – slogan. Improvised dance emerges from richly structured knowledge, shaped by the sensations and inspirations of the moment.

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