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Exploring the Biomedical Paradigm in the Work of Jan Fabre

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INTRODUCTION

Over the past thirty years Jan Fabre has produced a considerable body of work as a visual artist, theatre director and playwright. His work has been exhibited and performed throughout the world and he is well known as an innovative and versatile artist in the contemporary arts. Together with Anne Teresa De Keersmaker, Jan Decorte, Jan Lauwers, Wim Vandekeybus, Guy Cassiers and various others, he has been one of the creative minds behind the so-called 'Flemish Wave' in the performing arts: a generation of directors, choreographers, actors and dancers who, from the 1980s onward, has developed a highly individual artistic language on stage, breaking through the conventions of theatre and dance. In a special issue of *Théâtre-Public* devoted to the Flemish Wave, Christian Biet and Josette Féral describe them as 'free and insolent'; 'their practices operate against the current dominant forms of theatre, establishing performative styles that never cease to amaze us' (Biet and Féral 2014). Typical for Fabre within this Flemish Wave is his search for a more direct and physical language on stage.[1] Moreover, he tries to breach the boundaries between the different performing arts – theatre, dance, performance and opera. Fabre's performers differ from 'traditional monodisciplinary actors' in that they combine dance, theatre, performance art, visual arts and music theatre during their performances (Van den Dries 2006).

THE PERFORMATIVE IDIOM OF FABRE FROM ACT TO ACTING … AND BACK

Fabre began his career as a performance artist and this performance art has had a tremendous influence on his theatre work. In his first theatre performances Fabre introduced certain elements borrowed from performance art, such as 'real time/real action' (Van den Dries and Crombez 2010). Fabre's performers do not play a character, but instead execute certain tasks or actions. Through these acts, Fabre introduces a physicality not related to the 'character', but rather to the body and physical presence of the performer. The performer executes a task, and by expanding the timeframe (actions are often repeated in a loop or accelerated) this has a physical impact on the body. At the same time, the illusive side of theatre, its 'theatricality', is also an essential part of Fabre's theatrical idiom. Coming from the visual arts field, and strongly influenced by Marcel Duchamp, Fabre deals quite consciously with the medium of theatre. The act, executed as neutrally as possible, is already a form of acting, simply because it takes place on stage and is thus always a mise-en-scène. Consequently the performer's physical presence is always also, or always already, a theatrical presence.

One could say that Fabre's performative language is situated in the ancient paradox (formulated by Diderot in his famous essay *Le paradoxe sur le comédien* 1777/1830) between act and acting, which he reformulates through the introduction of performance art. His performative language lingers between physicality and theatricality and finds its most expressive power through the clash of 'real

[1] According to Roselee Goldberg this physical language is partly indebted to Performance Art (Goldberg, Performance: Live Art since the 60s, London Thames & Hudson, 1998: 65).

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time/real action' and 'illusion'. To illustrate this we refer to a famous scene from *The Power of Theatrical Madness* (1984).

In the first scene of *The Power of Theatrical Madness*, four men and four women are lined up at the back of the stage. Each man carries a woman in his arms. The men look dauntless. The women lay helpless in their hands. Here we witness a clear theatrical picture, a cliché, of men and women: the man/knight, strong and powerful, who carries the feeble but beautiful woman/princess. In the next sequence the men carry the women to the front of the stage and put them to rest. They say goodbye to the women, stand, and majestically walk to the back of the stage. The spectator recognizes this theatrical picture of the strong man and the weak, feeble woman: he has seen it before, not just in other theatre pieces but also in books and movies. The theatrical image constructed here is deeply engraved into the cultural canon. But the scene is not yet finished. After the men return to their position, the women awake, run to the back of the stage and jump into the men's arms. The scene commences again and repeats itself, not once but for a period of 20 minutes. During this time the cliché, or culturally encoded image, starts to decompose: the men's bodies begin to perspire and tremble, and they become barely able to carry the women. The heroes and princesses are reduced to perspiration and weight, thanks to endless repetitions and exciting acceleration. The 'physicality' takes over and intrudes upon the theatrical image. The performer's body begins to refuse to perform its role and becomes ever more present: muscles begin to contract, sweat appears and soon drips from the performer's face, and – finally – the body begins to refuse to perform the tasks. The image is no longer perfect – no longer a cliché – but has become 'embodied' by imperfect bodies. At the same time, however, this decomposed image – and this is the crux of Fabre's performative language – remains an image, for it takes place within the frame of the theatrical space. The physicality is staged. In short, the coup of the physical body is in fact a coup de théâtre. The spectator, in looking closer, witnesses that the performers' exhaustion is not merely evoked but also played out. The performers are not – or not only – victims of their physical condition:

■ Figure 1: Scene from *The Power of Theatrical Madness*. *© Wonge Bergmann*

they use this condition very consciously to create new images, images that surpass cliché and are hence richer in texture. The physical transition is thus not the basic objective but rather a tool to open different images. The physical transition enables a transformation from a traditional theatrical imagery to a performative language; the latter is the more original and surprising, as it is always 'affected' by the physicality of the changing bodies. Through this constant shifting Fabre's performative language unfolds itself as a renegotiation of the theatrical environment and the physical presence of the performer.

This accent on the physicality of the performers and the actual state of their real physical condition (for example, exhaustion, stiffness and pain) is intended to touch the audience. The physiological process in the performer's body, according to Fabre, is meant to reach the spectators in such a way that they too can experience the performer's pain, exhaustion or dizziness (Van den Dries 2006). To achieve this, Fabre places great importance on control of movement and physiological awareness. Thus, for Fabre it is essential that the performers learn to understand, recognize and control their bodies. This ability constitutes the foundation of Fabre's performative language.

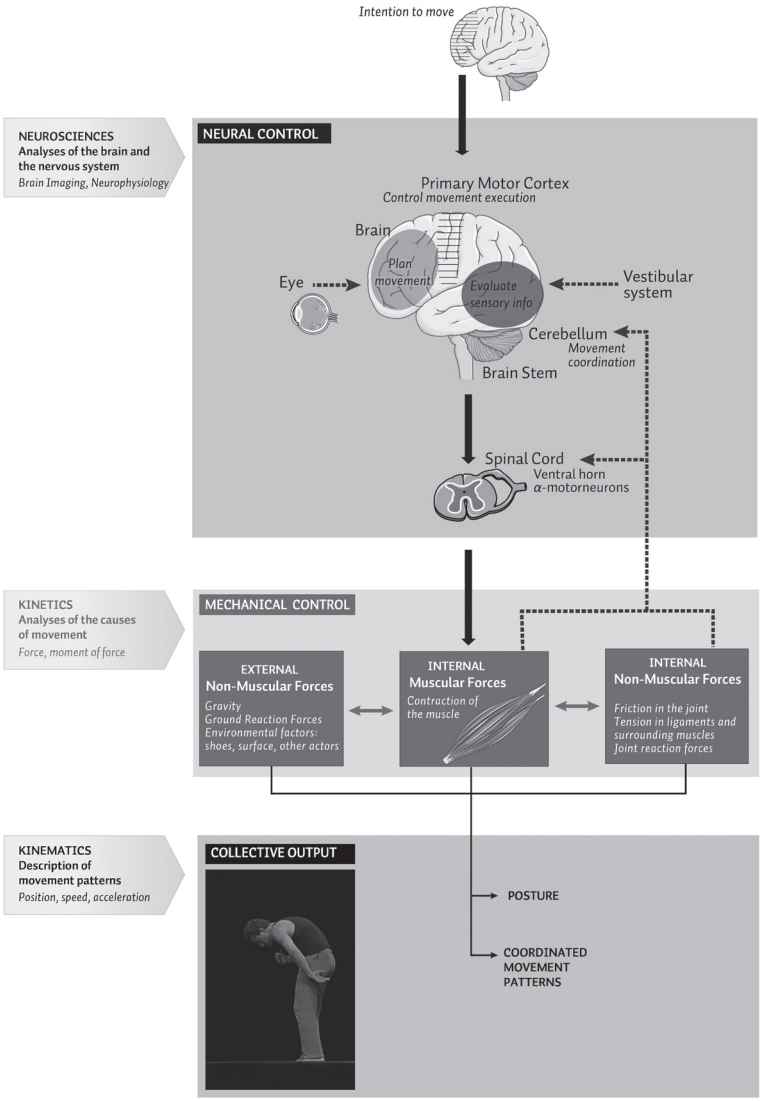
THE BIOMEDICAL ASPECT IN THE METHOD OF JAN FABRE

To increase physiological awareness and control of movement Fabre created a set of exercises, which he developed or appropriated from other acting/performing methods, to prepare his performers physically and mentally for what would be required from them on stage.[2] Through this set of exercises, performers learn to understand their physical impulses and how to manage them. The performers challenge their physical and mental concentration, pushing the limits of exhaustion, pain and dizziness, so as to learn how to control them. Through this set of exercises they also learn to explore this physical state of being, to recognize what is happening in their bodies and to test and explore them so as to transform them, to use the physical condition of their bodies at different moments. They switch from act to acting and back again, always commencing from the physical act and how it affects the body on its physiological level. The performers begin acting by playing with this physical state, by pulling it from its context, by enlarging all of it or just certain aspects.

This set of exercises gradually became a 'guiding line', aimed at introducing, in a condensed way, Fabre's performative language to his performers (Van den Dries 2006). In this guiding line Fabre places great importance on the body's balance (that is, the combination of postural and movement control), the use of one's joints, the articulation of the head, trunk and limbs, and the transferring of one's weight. The exercises draw much inspiration from animal behaviour, which Fabre studied extensively – not only for his work in the performing arts, but also for projects in the visual arts (Hertmans 2002). For example, Fabre asks the performers to imagine a reptile (such as a chameleon) catching an insect and to execute the tongue prehension and its retraction, the killing bite, the mastication, food transport and swallowing. Another example of animal behaviour frequently used by Fabre is that of a feline capturing its prey (stalking, focusing and pouncing onto the prey). Several assignments typically reoccur in the rehearsal processes and are crystallized into a fixed series of lessons that can be considered as the foundation of his 'physiological performing method'.

The training principles of physiological acting are founded on several years of observation and interpretation of the possibilities and capacities of the human body. This is a purely practice-based research method and is intuitively and subjectively managed by Fabre. The performers focus on the types of impulses that Fabre will demand during the rehearsals so as to be able to recall them, much like a physical reflex. In other words, these impulses must be available in the performer's nervous system such that they

[2] Fabre's set of exercises is a collection of invented exercises, effective scenes from his oeuvre and exercises he borrows from other acting methods, such as those of Grotowski, Meyerhold and Artaud, respectively.



■ Figure 2: Neuro-mechanical control of movement

can be drawn upon at any time. The training is not only about avoiding physical injuries. Fabre believes that it is centrally about reaching the right degree of tension in the body, a degree of alertness and flexibility such that the performer can switch smoothly between the various 'states' he or she must draw on during rehearsals. The set of exercises is meant to bring the performer into a state of readiness: a body on alert.

BIOMEDICAL PARADIGM WITHIN THE FRAMEWORK OF MOVEMENT SCIENCES

The domain of biomedical science aims to gain knowledge about the main principles of how the human body works. In this field, movement has long been an inspiring topic. In ancient Greece Aristotle sought to understand how movement is generated in animals; he presented his theory in the treatise 'De motu animalium'(Muybridge 1995). Eadweard Muybridge and Etienne-Jules Marey are considered the founders of modern movement sciences. In the nineteenth century both laid the foundations for movement registration techniques (stop-motion technique and chronophotography), allowing the recording of movements that the human eye could not distinguish (Muybridge 1995). Today, the interest in human movement remains keen, especially among dancers, actors and performers.

Biomechanics has been defined as the scientific discipline that studies the principles of human movement and provides information on muscular function and its characteristics (Koutedakis 2008). During the 1960s, researchers began to specifically examine the forces imposed on the body in ballet dancers. This was done using biomechanical principles and techniques, as ballet involves highly coordinated movements of the extremities (that is, legs and arms) and the trunk, while keeping the aesthetic aspect in mind. The same is true for performances. For example, in *The Power of Theatrical Madness* the carrying and positioning of the princesses requires highly coordinated movements of the performers. However, until now, no studies have been undertaken of performers or actors to gain insight into how they use their bodies.

In this section, we first explain the most recent theory concerning control of movement. By discussing the control of movement in relation to the performing arts we show how this theory is put into practice. Finally, we discuss why it is important to increase our insights into how Fabre's performers use their bodies on stage.

GENERATION AND CONTROL OF MOVEMENT

Voluntary movement starts as an intention in higher brain centres (that is, the *neural control*) (fig. 2). Through descending neural pathways in the spinal cord, α-motor neurons

are activated. These α-motor neurons innervate fibres of skeletal muscles and initiate muscle contraction (that is, muscle force). Patterns of muscle activity are converted into movement. The movement outcome is dependent on Newton's laws of motion; it is shaped by the interaction between the voluntary generated muscle forces and all other non-muscular (external and internal) forces, such as gravity, inertia, friction within a joint, tension in ligaments, capsule and muscles. The mechanical properties of the limbs are responsible for the *mechanical control* of movement. Skilled motor behaviour is energy efficient and appears effortless, yet actually reflects close interaction between the complex mechanical properties of the body and the neural control of the brain (Scott 2004). It is this interaction that represents the *neuro-mechanical concept of movement control (Nishikawa et al. 2007)* .

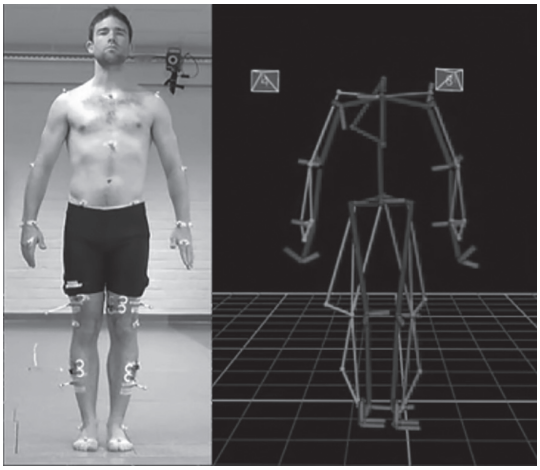
Coordinated movement patterns can emerge only if the generated muscle actions are an adequate response to the requirements of the task performed. It is therefore important to consider the action of the whole body, not just the action of the limbs. For example, during Fabre's cat exercise, the performer is asked to behave as a cat. He or she must articulate all segments of the body so as to mimic a cat's movements. The muscle activity of trunk and extremities is task-specific, meaning that a highly specific sequence exists for each movement. It is the coordination between the shoulder girdle and pelvic girdle, which rotate in opposite directions, which creates the image of a feline moving about.

Postural control, the ability to maintain an upright standing posture while moving the gesturing leg, is also crucial during Fabre's exercises. The performer's weight must be shifted on to the supporting leg, and muscles need to stabilize the trunk while performing movements with the other leg. This is extremely important in Fabre's old man exercise, where the performers start in a line against the wall and walk trembling through an imaginary apartment. Each performer must control both the stooped position of the trunk and the position of the standing leg, all while preparing for the next – very slow – step forward. This spatial conquest, which occurs in millimetre increments, demands tremendous physical concentration from the performers.

Insight into the neuro-mechanical control of movement can be gained through biomechanical analysis of the observed movement patterns. Wilson and Kwon (2008) describe how biomechanics observes both kinematic and kinetic aspects of a dancer's movement. *Kinematics* provide a description of movement patterns (fig. 2): how far and how fast the movement is, how much it changes and what type of motion is involved (Wilson and Kwon 2008). Kinematic analysis is used to describe a dancer's movement, by quantifying the component joint motions and the ranges of motion of individual joints. As such, it provides a foundation for understanding how these elements contribute to either task, and allows identification of key events in the skill (Wilson and Kwon 2008). Most skilled movements, such as the exercises proposed by Fabre, involve a combination of postural control and movement coordination and can be considered the collective output of the above lying 'black box' of neuro-mechanical control.

Kinetics examines the causes of movement, in terms of internal and external forces and moments (torques) (fig. 2). The internal forces and moments acting on the bones, joints, muscles and other connective tissues are determined by the amount of muscle activation necessary to generate the desired movement or are a response to external forces from the environment, such as other dancers, training spaces or footwear (Wilson and Kwon 2008). Detecting the internal and external forces and moments allows the researcher or dance teacher to better understand how movement is produced.

In order to obtain a full image of the progress and control of movements, kinematic data obtained from optometric and/or electromagnetic movement registration must be combined with force measurements and electromyography. Since Muybridge's



■ Figure 3: Positioning of reflective markers and 3D reconstruction of captured markers in one of Fabre's performers. The left picture illustrates the positioning of reflective markers, the right picture demonstrates a 3D reconstruction of the captured markers.

chronophotography, there have been huge improvements in techniques to capture human movement, especially in recent decades. Modern high-resolution cameras allow for capturing human movement with high precision. With accurate calibration of camera positions, the obtained 2D images (fig. 3) from the separate cameras assist in 3D reconstruction of the captured markers. Biomechanical models then allow for gaining insight into movement at the level of individual joints via calculating time profiles and ranges of motion during movement. Combining this kinematic information with information on muscle activation patterns obtained from electromyography, affords further insight into how movement emerges at individual joint levels.

Fabre's exercises represent a challenge for neuro-mechanical control. Furthermore, one of Fabre's special interests is to parameterize what is happing in the bodies of his performers, in order to study and improve his teaching methods. Biomechanical analysis of the movements performed during Fabre's exercises allows for further insight into how the performers control their bodies. This understanding will help guide them towards what is expected.

EXAMINING CONTROL OF MOVEMENT IN PERFORMERS

Remarkably, despite the fact that a sizable body of literature exists regarding biomechanical research and control of movement about dancers, no studies have examined control of movement for actors or performers. Moreover, the studies performed on dancers have mainly evaluated 'predictable' movement patterns, using predefined, standardized clinical tests (Roussel et al. 2009, Roussel et al. 2013), or specific (ballet) movements (Krasnow *et al.* 2011). However, experimental studies examining voluntary (that is, unpredictable) control of movement, such as is the case in performers, are lacking.

We examined the voluntary control of movement of Jan Fabre's performers to gain insight into the way they primarily use their bodies. In contrast to the above-mentioned studies on dancers, where control of movement was examined to improve technical skills or reduce injuries, the aim of this study is to examine the physical aspect of performing – to explore the physiological awareness of the body, recognize it and engage it – which is the foundation of Fabre's work with his performers.

Twenty performers (some trained by Fabre and some who were novice performers) were evaluated in a multi-disciplinary, motion analysis laboratory (M²OCEAN) equipped with an automatic 3D motion capture system and surface electromyography. After a 5-minute warm-up session, participants were asked to perform two exercises from Fabre's set of exercises:

The cat exercise, where the performer is asked to execute transitions between immobile postures and some rapid movements or dynamic changes of directions, as does a cat when preparing to jump. However, these movements must be executed with extreme precision (for example, postural control of the trunk in four-point kneeling position and coordinated movement patterns of trunk and extremities) and the performer must be cognizant to use the entire available space during the exercise.

The old man exercise, where the performer is asked to move extremely slowly. This exercise is characterized by 'rigid positioning' of the trunk, together with rather 'stiff' movements of the extremities. The performers are asked to co-contract their muscles as much as possible, so as to illustrate the rigid aspect of the exercise and the extreme muscle fatigue (that leads to muscle cramps). The spatial conquest, which occurs in millimetre increments, demands

tremendous physical concentration from the performers throughout this 20-minute exercise.

Unlike previous research on the control of movement of dancers, no other information or requirements were given, thereby allowing the performers to express themselves freely during these exercises. Kinematic and kinetic analysis of the observed, unpredictable, movement patterns and muscular actions allow us insight in to body position (for example, the stooped position during the old man exercise), use of space, coordination of movements, movement speed and muscle fatigue, among others. Comparing the data between trained and less trained performers allows for characterizing the physical aspect of performing, as described below.

Figure 3 compares the respective kinematic features of an experienced and a less experienced performer during the old man exercise. Several remarkable differences are noticeable. There is a difference in body posture between both performers. The less experienced performer begins in an extremely flexed position (approximately 40° flexion in hip and knee); however, as the exercise proceeds he becomes unable to maintain this position. Consequently, the performance is characterized by a large amount of step-to-step variability, that is, there are sizeable differences in joint flexion from step to step. The experienced performer adopts a more erect position (although he is not standing upright) and is able to maintain it throughout the exercise.

In analysing the muscle activity during this exercise, it appears that the experienced performer demonstrates highly stable values, that is, with the muscles in the back (erector spinae) that are active more than 95 per cent of the time. In contrast, the activity percentages for the less experienced performer vary from 66 per cent to 99 per cent. These data illustrate one aspect of the 'physicality of Fabre's performer': whereas the experienced performer is able to control his body throughout the whole exercise (no variation in muscle activity or body position) and adjust and modulate it, the performance of the less experienced performer is characterized by variability in both muscle activity and body positioning. These data can be used to objectify, develop and further improve the skills of performers, and to improve Fabre's teaching method.

DISCUSSION: DOES THE BIOMEDICAL PARADIGM FIT THE ARTISTIC ONE?

Researchers from theatre studies and movement sciences share a particular interest in the analysis and visualization of movement. Both disciplines search for methodologies to observe, describe and understand movement. In recent decades outstanding efforts have

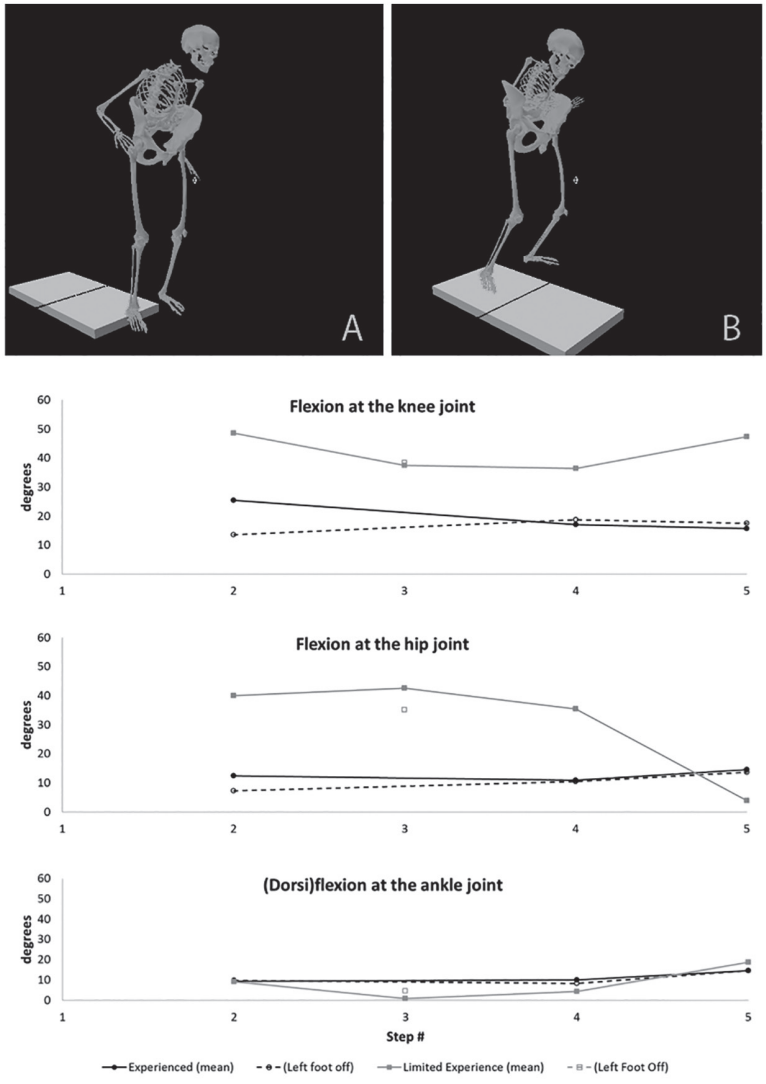


Figure 4: Comparison of the kinematics of body posture during the old man exercise between an experienced (A) and a less experienced (B) performer. The top panel shows the body posture while performing the old man exercise. The bottom panels show the mean joint angles (amount of flexion in degrees) at the hip, knee and ankle over five consecutive steps.

been made to improve the techniques used to visualize and capture movement. However, there are fundamental *differences* between the disciplines. Movement scientists are keen to quantify observed movement in terms of objective variables, yet the movement itself is decontextualized within this paradigm. For example, the movement of straightening one's arm to take a cup of coffee will be described in terms of range of motion (that is, movement amplitude), coordination between segments, speed, forces and torques. The priority is examining the arm movement; much less attention is paid to context or intention. Research from theatre studies, in contrast, deals with movement in a subjective and theatrical context and it is this context that is the most important factor. In the paradigm of theatre studies, reaching out one's arm to take a cup of coffee is absolutely not comparable to the same movement done so as to touch a loved one. Indeed, the two movements are drastically different, if not contradictory, although biomechanically they are the same.

Here *interdisciplinary research* proves to be of great value for both disciplines. For theatre researchers and theatre practitioners who study movement, developing better knowledge about the biomechanical nature of movement will contribute to a more effective understanding of performance. The movement will not be reduced to a mere symbolic gesture but will instead be grounded in a body with its own particular physicality. Similarly, elements of theatre studies can be integrated into movement sciences. For example, examining context and movement intention will force researchers from movement sciences to consider movement as something that always has context and intention. This increases the complexity of the methodology, yet leads to a more complex and engaged understanding of movement.

This collaboration will force both disciplines *to rethink their traditional models*. For example, researchers from movement sciences need to develop new statistical models to examine unpredictable, non-repetitive movement patterns, which are highly different from the cyclical human locomotion traditionally assessed in our lab. Likewise, we must deal with a massive amount of data: our biomechanical model provides forty-eight degrees of freedom, meaning that we need forty-eight joint angular time profiles (graphs) to describe in detail the movements of the entire body; moreover, we measured the activity of twelve individual muscles, and this provided detailed information about timing and force generation. This bulk of information needs to be reduced to several key parameters characterizing the '*physicality of the act*'. A key question that then arises is whether the observed differences in quantitative data are also relevant for theatre studies. A further aspect relates to the variability in the dataset. It is well known that a learning process is characterized by large variability at the beginning and more consistent performances (that is, less variability or consistent trials) at the end. Moreover, the 'voluntary' character of the exercises performed introduces an extra degree of variability into our dataset. Using new movement analysis techniques rooted in the domain of motor learning and motor control (that is, investigating step-to-step variability as opposed to the evaluation of means), we will try to separate variability related to the voluntary nature of the exercise from the variability in performance that stems from inexperience (inconsistent *artistic* performance). Although these innovative analysis techniques have the intention of characterizing movement variability, they are traditionally employed for rather stereotyped movement (for example, reaching, pointing, locomotion). Therefore, the challenge will be to adapt them to the analysis of voluntary, non-predictable movement patterns.

The combination of theatre studies and movement sciences provides a unique opportunity to visualize and understand movement in an arts setting. Working in a fully equipped state-of-the-art research centre will allow us to capture the movement sequences and better understand the subtleties of movement. Awareness of these subtleties will

allow performers to explore and experiment with them. In respect to Jan Fabre, keener insight into the exercises will certainly increase the likelihood of physical transformation and will impact the relationship between act and acting. Further research is necessary to examine how this interdisciplinary research will impact related issues and the cultural and scientific fields involved.

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